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METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY

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B. Bibliographic references to other items of interest to the profession.

C. Cumulative, annotated bibliographies on subjects of immediate and special interest to meteorologists.

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METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY

MALCOLM RIGBY, Editor

Vol. 1 APRIL 1950 No. 4

SPECIAL FEATURE IN THIS ISSUE

A Selective Annotated Bibliography on Hail

(For complete table of contents see back cover)

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FOREWORD

Each issue of Meteorological Abstracts and Bibliography consists of four parts, as can be seen in the table of contents on the back cover.

Part I comprises 100 to 200 classified and annotated references to current material in the field of *Meteorology* and other fields immediately applicable to *Meteorology*.

In addition, the first issue (Vol. 1, No. 1) contained a **Review of 30 Current Meteorological Periodicals,** and the second issue a **Review of 15 Meteorological Periodicals which have lapsed.** Reviews of irregular publications (serials), bibliographic sources, and miscellaneous periodicals which frequently contain meteorological literature will appear as soon as practicable.

Part II of each issue provides a means of accumulating the important references on given subjects without respect to recency. It is impossible to make these bibliographies exhaustive under present personnel, time and printing limitations; but every attempt is made to include a representative cross section of the various aspects of each subject, some preference being given to recent material, comprehensive works, those from obscure sources and those with good bibliographies.

Selective, annotated bibliographies consisting of from 100 to 300 items each, have been printed in the issues of Meteorological Abstracts and Bibliography, as follows:

(1) **Atmospheric Pollution,** Vol. 1, No. 1, Jan. 1950
(2) **Aerobiology,** Vol. 1, No. 2, Feb. 1950
(3) **Cloud Physics and "Rain Making,"** Vol. 1, No. 3, March 1950
(4) **Hail,** Vol. 1, No. 4, April 1950

Future issues will contain:

(5) **Tornadoes,** Vol. 1, No. 5, May 1950
(6) **Volcanic Dust,** Vol. 1, No. 6, June 1950
(7) **Climatic Changes,** Vol. 1, No. 7, July 1950

Other subjects which will appear in early issues are: **Thunderstorms, Icing, Energy Exchange in the Atmosphere,** etc.

In Part III the contents of those journals which are primarily meteorological are listed and published in the earliest issue where space permits. These entries are not classified or indexed, as it is thus possible for the information to appear a month or two earlier than would be the case if a more rigid form of entry were used.

Part IV consists of author, subject and geographical indexes. The subject and geographical indexes are made up, as a rule, from the subject headings which follow each entry in parts I and II.

In the June and December issues *cumulative* author and subject indexes will be published.

LIST OF PERIODICALS

Note: In this list the preferred form of title for entry is given in bold face type. If the title is distinctive, the name and headquarters of the issuing society or organization follows the title. If the title is not distinctive the issuing organization precedes and is part of the title.

PERIODICALS IN WHICH METEOROLOGICAL ARTICLES REGULARLY APPEAR

Akademiia Nauk, SSSR, Izvestiia, Ser. Geogr. i Geofiz., [Moscow].

American Geophysical Union, Transactions, National Research Council, Washington.

★**American Meteorological Society, Bulletin,** [Boston].

★**Annalen der Meteorologie,** Meteorologisches Amt für Nordwestdeutschland, Hamburg, [British Zone, Germany].

Annali di Geofisica, Istituto Nazionale di Geofisica, [Rome].

Ciel et Terre, Société Belge d'Astronomie, de Météorologie et de Physique du Globe. Uccle-Bruxelles.

Geofisica Pura e Applicata, Istituto Geofisica Italiano, [Milan].

Geophysical Magazine, [Central Meteorological Observatory, Toyko].

Hemel en Dampkring, Nederlandse Vereniging voor Weer- en Sterrenkunde, [The Hague].

★**Időjárás,** Az Országos Meteorológiai és Földmágnességi Intézet, [Budapest].

Journal of Geophysical Research (formerly Terrestrial Magnetism and Atmospheric Electricity), [Washington].

★**Journal of Meteorology,** American Meteorological Society, [Boston].

★**Journal Scientifique de la Météorologie,** Société Météorologique de France, [Paris].

★**The Marine Observer,** Air Ministry, Meteorological Office, London.

★**The Meteorological Magazine,** Air Ministry, Meteorological Office, London.

★**Meteorological Society of Japan, Journal,** Second Series, Kisho Shushi, [Tokyo].

★**Meteorologické Zprávy,** Státní Meteorologický ústav v Praze, [Prague].

★**La Météorologie,** Société Météorologique de France, [Paris].

★**Meteorologische Rundschau,** Bad-Kissingen, [U. S. Zone, Germany].

★**Monthly Weather Review,** U. S. Weather Bureau, Washington, D. C.

★**Nimbus,** Sociedad Meteorológica de Bolivia, [La Paz].

Polarforschung, Archiv für Polarforschung in Kiel, [Kiel, British Zone, Germany].

★**Revista Meteorológica,** Junta Nacional de Meteorología, Montevideo.

★**Rivista di Meteorologia Aeronautica,** Associazione Culturale Aeronautica, [Rome].

★**Royal Meteorological Society, Quarterly Journal,** [London].

The **Royal Society of London, Proceedings, Series A, Mathematical and Physical Sciences,** [London].

★**Tellus,** Svenska Geofysiska Föreningen, Stockholm.

Vsesoiuznoe Geograficheskoe Obshchestvo, SSSR, Izvestiia, [Moscow-Leningrad].

★**Weather,** Royal Meteorological Society, [London].

★**Weatherwise,** Amateur Weathermen of America, Philadelphia.

★**Wetter und Klima,** Deutscher Meteorologischer Dienst im Französischen Besatzungsgebiet, Seelbach b. Lahr/Baden, [French Zone, Germany].

★**Wetter und Leben,** Österreichische Gesellschaft für Meteorologie, [Vienna].

★**Zeitschrift für Meteorologie,** Meteorologisches Observatorium, Potsdam, [U. S. S. R. Zone, Germany].

★ Indicates those periodicals which are primarily meteorological.

EXPLANATIONS

Location of material: While it is physically impossible to give for each entry the name of ever library where that item might be obtained, it is possible, by using standard library symbols, to giv the reader some idea of where he might obtain such material. So in most instances a symbol take from the Union List of Serials (Gregory), or the Union Catalogue of the Library of Congress will b given just before the text of each abstract. In some cases where no symbol has been assigned t a library, one will be invented by using the general principle of the Union Catalogue list. As a rul the library indicated will be in the District of Columbia, with an occasional reference to one in Ne York or Boston. It will be noted that D stands for District of Columbia, M for Massachusetts an N for New York. Thus **DWB** stands for the U. S. Weather Bureau Library in Washington, D. C and **MH–BH** for the Blue Hill branch of the Harvard Library in Boston, Mass. In the latter case since the Blue Hill Observatory contains not only the Harvard Observatory Library but that of th American Meteorological Society, the same symbol (**MH–BH**) will stand for either or both libraries.

Library symbols: The following abbreviations have been used for Libraries in which the specifi material thus indicated in this issue is located:

DA:	U. S. Department of Agriculture Library, Washington, D. C.
DAMS:	Material in hands of American Meteorological Society Abstracts, P.O. Box 1736 Washington 13, D. C.
DAWS:	Air Weather Service, Technical Information Files, Andrews Air Base, Washingto 25, D. C.
DBS:	U. S. Bureau of Standards Library, Washington, D. C.
DGS:	U. S. Geological Survey Library, Washington, D. C.
DLC:	Library of Congress, Washington, D. C.
DM:	U. S. Bureau of Mines Library, Washington, D. C.
DPL:	U. S. Department of Defense, (Pentagon) Library, Washington, D. C.
DSG:	U. S. Army Medical Library, Washington, D. C.
DWB:	U. S. Weather Bureau Library, Washington, D. C.
MH:	Harvard University Library, Cambribge, Mass.
MH–BH:	Harvard University, Blue Hill Observatory (and American Meteorological Society Library, Milton, Mass.
NNM:	American Museum of Natural History Library, New York.
NSGE:	General Electric Research Library, Schenectady, N. Y.

Geographical (place) names are in the form generally used internationally, rather than in the form used locally. For instance Vienna is used instead of Wien, Florence for Firenza, Moscow for Moskv and Germany for Deutschland, etc.

Titles of articles or monographs are in the language of the original article unless otherwise stated Slavic (Cyrillic) titles are transliterated according to the Library of Congress transliteration scheme into the Roman Alphabet.

Entries for **titles of periodicals** are given in the form used on the title page of the periodical providin the title is distinctive (Monthly Weather Review, Meteorologiské Zprávy, and Revista Meteo ológica). If the journal is the official organ of a society or institution and the title is not distinctive as is the case with Transactions, Bulletins, Proceedings, Comptes Rendus, Trudy, Izvestiia, Sitzungs berichte, Verhandelingen, Miscellanées, etc., the preferred name of the organization is given firs as part of the title (American Geophysical Union, Transactions; Royal Society of London, Pro ceedings).

Abbreviations and other symbols:

Titles of periodicals are not abbreviated as a rule. Other abbreviations will be used sparingl and only when the abbreviation is obvious.

The months of the year from March through July are not abbreviated. Other months ar abbreviated as Jan., Feb., Aug., Sept., Oct., Nov., and Dec., respectively.

The word or abbreviation for Volume, (Tom, Band, Jahrgang, Año, etc.) and for Numbe (Heft, Fascicule, Vypusk) and page or pages is omitted from most entries. Thus an entry will rea as follows:

Meteorologische Rundschau 2(5/6):146–151, May/June 1949.

This indicates that the article was in the Meteorologische Rundschau, Jahrgang 2 (Vol. 2) Heft 5/6 (No. 5 and 6), pages 146–151, Mai/Juni 1949.

The symbol * before an entry indicates a good data source.

The symbol † before an entry indicates a good bibliography source.

The symbol § indicates a synoptic case history study accompanied by charts.

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL MATERIAL

GENERAL METEOROLOGY

4–1 551.5(09)(415)

Dixon, F. E., **Meteorology in Ireland.** *Weather,* 5(2):63–65, Feb. **1950.** fig., photo. **DWB**—Historical account. Picture of R. Kirwan. *Subject Headings:* **General meteorology, History, Ireland.**

4–2 551.5:629.13(262)

*Great Britain Meteorological Office, **Aviation meteorology of the route Marseilles-Castel Benito.** London, H. M. Stationery Office, **1949.** 42 p., 9 figs., 5 tables, 8 refs., (5 append. of climatological tables). ([Great Britain] Meteorological Office. Meteorological Reports, No. .) At head of title: M. O. 496d. **MH-BH**—Deals with meteorology and climatology of central Mediterranean. Includes tracks of depressions, air mass characteristics, upper wind oses, equivalent head- and tail-winds, flying fitness, etc. *Subject Headings:* **Aeronautical meteorology, Aviation climatology, Mediterranean.**

4–3 551.5:61

Hann, F., **Witterung und Tätigkeit des praktischen Arztes.** [Weather and the work of he practicing physician.] *Wetter und Leben,* 2(7–8):167–168, Dec. **1949. DWB, MH-BH**—*Subject Heading:* **Medical meteorology.**

4–4 551.5:531.5(02)

Sänger, Raymund, **Ballistische Störungstheorie unter besonderer Berücksichtigung der Witterungseinflüsse.** [Ballistic perturbation theory with special consideration of weather influences.] Basel, Verlag Birkhaüser, **1949.** 226 p., 45 figs., 8 tables, numerous equations. Append. **DLC**—A manual based on the experience of the Swiss Artillery Weather Service during and since the Second World War. The book presents not only the basic differential equations which enter into the general and special theories of ballistic deviations; but many tables and nomograms, based on empirical data, make it possible to calculate quickly the effect of variations in density, temperature, wind, earth's rotation and trajectory, rain, etc., on the path of a projectile. A chapter is devoted to the standard atmosphere, one to the generalized Darrieu formulae, another to the methods of observation and computation employed by the Artillery Weather Service in Switzerland (including several excellent photographs of equipment and sounding devices), and a separate chapter to each of the above named elements which affect the flight of missiles. *Subject Headings:* **Atmospheric structure, Ballistics, Manuals, Switzerland.**—*M.R.*

METEOROLOGICAL OBSERVATIONS AND INSTRUMENTS

OBSERVATIONS

4–5 551.501:551.525

Balls, W. Lawrence, **Soil temperatures on tap.** *Weather,* 5(2):40–43, Feb. **1950.** 2 figs., 1 refs. **DWB**—Mean soil temperatures at three foot depth obtained from temperature of tap water after long passage through buried mains. *Subject Headings:* **Soil temperature, Methods of observation.**

4–6 551.501:551.521.3

Malsch, Wolfgang, **Die Ermittlung des atmosphärischen Transmissionskoefficienten durch einfache astronomische Beobachtungen.** [The estimation of atmospheric transmission

coefficients by simple astronomical observations.] *Meteorologische Rundschau*, 2(7–8):202–206, July–Aug. 1949. fig., 3 tables, ref. **MH-BH**—Requires only a field glass or telescope, accurate watch and various astronomical tables. Numbers of stars of different magnitudes visible in known areas near zenith and horizon are counted and compared with number from star tables. Method of calculating transmission coefficient from these data set out. *Subject Headings:* **Methods of observation, Transmission coefficients.**—*C.E.P.B.*

4–7 551.501.4:551.524.3

Conrad, V., **A new criterion of relative homogeneity of climatological series.** *Archiv für Meteorologie, Geophysik und Bioklimatologie*, Ser. B, 1(1):1–8, **1948.** 2 figs., 4 tables, 5 refs., equations. Summary in English, German and French p. 1–2. **MH-BH**—Frequency distribution of differences of mean annual temperatures, New York–New Haven (70 mi. apart) 1824–1923, in a uniform climatic region, gave $\sigma = 0.90°$F. and negative skewness. Critical investigation showed two periods of sharply opposed discontinuities 1875–1880 and 1911–1919, explained by the history of the stations. Omitting the 15 disturbed years, the distribution became Gaussian, $\sigma = 0.66°$, and the remaining 85 years form nearly homogeneous series. It follows that if the frequency curve of differences between two stations is Gaussian, the series are both homogeneous. *Subject Headings:* **Statistics in climatology, Temperature variations, New York, New Haven.**—*C.E.P.B.*

4–8 551.501.7(98):551.508.822:551.501.9(02)

Girs, A. A., **Rukovodstvo po radiozondirovaniiu atmosfery dlia aërologicheskikh stantsii arktiki.** [Handbook of radio soundings of the atmosphere for Arctic aerological stations.] Moscow, Izdatel'stvo Glavsevmorputi, **1946.** 251 p., 90 figs., 29 tables, 21 refs., equations, 4 append. (SSSR, Glavnoe Upravlenie Severnogo Morskogo Puti, Arkticheskiĭ Nauchno-issledovatel'skii Institut, Seriia; Posobiia i Rukovodstva, Vypusk 16.) **DLC**—This handbook, the 16th of a series of manuals for meteorological, hydrographic and oceanographic observers in the Arctic, is a revision of one issued in 1944 by Girs and Nikolaeva on *Aerological Observations at Polar Stations*. The present edition does not deal with pilot balloon observations, however, but goes more into detail regarding radiosonde techniques and equipment.

The author takes up in a systematic way: (I) The construction and operation of the Molchanov Radiosonde, (II) The establishment and maintenance of Arctic aerological stations, (III) The preparation, launching and transmission and reception of radiosonde signals, (IV) The computation or compilation of the records. An appendix contains conversion and computation tables of all kinds. The volume contains nearly a hundred illustrations of equipment, installations and activities connected with filling and launching balloons. Samples of forms used in radiosonde work, are inserted as fold-ins. The comprehensive and detailed presentation would enable any observer to install, maintain and operate equipment even under rigorous circumstances in isolated locations. *Subject Headings:* **Aerological observations, Upper air observations, Radiosondes, Manuals, Arctic, U.S.S.R.**—*M.R.*

4–9 551.506.1:519.2

Neis, B., **Häufigkeitsstatistik im monatlichen Witterungsbericht.** [Frequency statistics in the monthly weather report.] *Zeitschrift für Meteorologie*, 3(8–9):266–269, Aug.–Sept. 1949. 4 figs., table. **DWB**—Monthly totals of rainfall and number of raindays give insufficient information; daily falls for a large number of stations are costly to print and hard to grasp. Author describes a regional table which gives numbers of stations (as % of total number) having monthly and daily rainfalls within given limits, having maximum rainfall of month on given dates, and other information. [The table is hard to understand.] The figures can be represented graphically in color and printed on a map to show distribution. *Subject Headings:* **Monthly summaries, Statistical analysis.**—*C.E.P.B.*

4–10 551.506.8

Regula, Herbert, **Einige Ergebnisse der Radiosondenaufstiege der Deutschen Arktischen Expedition 1938/1939.** [Some results of radiosonde ascents by the German Arctic Expedition 1938/1939.] *Meteorologische Rundschau*, 2(7–8):229–232, July–Aug. 1949. 3 figs., table, 5 refs. **MH-BH**—On the out- and home-voyages 184 radiosonde and 125 upp-

wind ascents were made; original material mostly lost. Vertical air motion to 7 km. between Bay of Biscay and equator is set out diagrammatically. A table gives temperatures up to 3 km. between 54° and 67°S. showing rapid increase of temperature gradient with height. *Subject Headings:* **Upper air observations, Atlantic, Antarctic.**—*C.E.P.B.*

4–11 551.506.7:519.2

Walker, Gilbert T., **Some correlation coefficients between certain upper air data.** London, H. M. Stationery Office, **1949.** 7 p., 2 tables, 11 equations. ([Great Britain] Meteorological Office. Professional Notes, No. 97.) At head of title: M. O. 420q. **DWB**—Correlation coefficients are given between ozone content, pressure at 0, 5 and 7 km., temperature at 7 km., height of tropopause and day-to-day persistence. Regression equations are calculated. Results are discussed in light of work by B. and E. Haurwitz (1939). *Subject Headings:* **Upper air data, Correlation coefficients.**

4–12 551.506.8

Morgen, Alois, **Phänometrie des Flächenwachstums lebender Pflanzenblätter.** [Photometry of surface growth of living plant leaves.] *Wetter und Klima*, 2(1–2):1–15, Jan.–Feb. **1949.** 4 figs., 3 tables, 10 refs. **DWB**—After an historical introduction, describes a method devised at Trier (Treves). Blue prints were taken daily between glass and celluloid sheets of several leaves of various trees, and measured with a polar planimeter. The method is accurate to 0.1 cm². *Subject Heading:* **Phenology.**—*C.E.P.B.*

4–13 551.506.8

Schneider, Max, **Periodische Schwankungen in der Vegetationszeit der Laubbäume.** [Periodic variations in the vegetation period of deciduous trees.] *Meteorologische Rundschau*, 2(5–6):146–151, May–June **1949.** 15 figs., 12 refs. Summary p. 146. **DWB**—Author analyzed data, 1870–1946, of vegetation period of horse chestnut. There is a clear 11-year rhythm (amplitude 3½ to 4 days, ca. 5%) closely parallel to sunspot cycle, and also an 8-year cycle. The period from leafing to ripening shows only the 8-year cycle. The 11-year wave is found in other vegetation periods in the Rhine plain, but not the 8-year, which must be regarded as doubtful. *Subject Headings:* **Phenology, Periodicities, Germany.**—*C.E.P.B.*

4–14 551.507.362:551.506.7

†Newell, Homer E., Jr., **A review of upper atmosphere research from rockets.** *American Geophysical Union, Transactions*, 31(1):25–34, Feb. **1950.** 6 figs., 34 refs. Abstract p. 25. **MH-BH**—Research on the upper atmosphere with the V-2 and Aerobee rockets is reviewed; including progress in control of flight, tracking and recovery of instruments and data, and future research program of Naval Research Laboratory working together with the Signal Corps, Air Force and Applied Physics Laboratory. Relation of altitude to pressure and temperature up to 120 km. as determined from flights in New Mexico, shown graphically. Solar spectrum, ozone concentration, cosmic radiation, ionospheric and photographic data on cloud formations, are discussed and illustrated. *Subject Headings:* **Rockets, Upper air observations.**—*M.R.*

INSTRUMENTS

4–15 551.508.2:551.521(03)

Mörikofer, W., **Zur Terminologie in der Strahlungsforschung.** [On terminology in radiation investigations.] *Archiv für Meteorologie, Geophysik und Bioklimatologie*, Ser. B, 1(1):32–44, **1948.** 25 refs. Summary in German, English and French p. 32. Sauberer, F., **Bemerkungen zu Fragen der praktischen Strahlungskunde.** [Remarks on questions of practical radiation technique.] *Idem*, 54–62. fig., 2 tables, 13 refs. Summary in German, English and French p. 54–55. **MH-BH**—Mörikofer lists common terms and sets out difficulties of nomenclature. Summarizes types and names of instruments and points out need for more accurate nomenclature. Sauberer also discusses nomenclature and errors of Robitzsch actinograph. *Subject Headings:* **Radiation instruments, Radiation measurements, Glossaries.**—*C.E.P.B.*

4–16 551.508.21:551.508.2:551.52

*Courvoisier, P. and Wierzejewski, H., **Beiträge zur Strahlungsmessmethodik I: Die physikalischen Grundlagen der kalorischen Strahlungsmessmethoden.** [Contributions to the technique of radiation measurements I: The physical basis of calorimetric radiation technique.] *Archiv für Meteorologie, Geophysik und Bioklimatologie*, Ser. B, 1(1):45–53, **1948.** table, 1 refs. **II: Die Berechnung der Wirkungsweise kalorischer Strahlungsmessinstrumente.** [The calculation of the rate of operation of calorimetric radiation instruments.] *Idem*, 1(2):156–199 **1948.** 5 figs., table, 9 refs., 83 equations. Summary in German, English and French p. 156–157. **MH-BH**—Methods of measuring radiation are analyzed and classified, and principles of calorimetric methods discussed. The second paper discusses measurement of flow of heat produced by absorption of radiation by analogy with electric currents, and solves resulting differential equations. Results can be applied to any instrument and are tested on Abbot's silver-disc pyrheliometer. *Subject Headings:* **Radiation measurements, Radiation instruments.**—*C.E.P.B.*

4–17 551.508.23:551.521.11(73)(4

Gorczyński, Wladyslaw, **Zur Vergleichbarkeit der Sonnenscheinregistrierungen von Europa und Nordamerika.** [The comparability of sunshine records in Europe and North America.] *Archiv für Meteorologie, Geophysik und Bioklimatologie*, Ser. B, 1(2):200–206, **1949** 4 tables, 3 refs. Summary in German, English and French p. 200–201. **MH-BH**—The comparability of sunshine records of Marvin heliograph (U.S.) with "Twilight Correction" added and Campbell-Stokes recorder (C.S.) is examined by using pairs of stations along U.S.-Canadian border. Difference US − CS averages 1 hour (Jan. 0.5, July, Aug. 1.6). Direct comparisons at San Diego and Blue Hill showed that CS is more sensitive in early morning and late evening. *Subject Headings:* **Sunshine recorders, Sunshine duration, United States Europe.**—*C.E.P.B.*

4–18 551.508.

Ives, Ronald L., **Remote indicating and recording wind equipment, Part I.** *American Meteorological Society, Bulletin*, 30(9):321–325, Nov. **1949.** 5 figs., ref. Abstract p. 321 *Idem*, Part II, 30(10):352–356, Dec. **1949.** 9 figs., 2 refs. **DWB**—Design and operation of equipment for recording wind direction and speed at a point some miles from the point or points at which the observations are desired. The author briefly outlines the research and development which was initiated by the Chemical Warfare Service at Dugway Proving Ground in Utah. Then in part I he goes into detail regarding the mechanical and electrical design of equipment, the transmission of signals, protection against static, manual operation when only a few readings a day are desired, and method of recording signals. In part II he describes the method of relaying information from seven stations by a totally automatic system, the repeaters necessary for very distant relaying, chart readers, the limitations of the system and performance record. Expense of equipment is justified by saving in observers. Installations equipment and design of equipment illustrated in detail by means of photographs and schematic or wiring diagrams. *Subject Headings:* **Automatic weather stations, Wind instruments, Recording equipment.**—*M.R.*

4–19 551.508.5

Ciarpaglini, Rodolfo, **Anemometro a mano a pressione.** [Hand pressure anemometer.] *Rivista di Meteorologia Aeronautica*, 9(3):42–43, July–Sept. **1949.** 4 figs. **MH-BH**—Description and illustration of the internal mechanism and mounting of a modern type of hand pressure anemometer, said to be highly sensitive and easily read by means of an indicator on a dial. *Subject Headings:* **Anemometers, Wind instruments.**—*M.R.*

4–20 551.508.

Morasca, N., **Ulteriori osservazioni sul registratore di umidità specifica.** [The latest observations on registration of specific humidity.] *Rivista di Meteorologia Aeronautica* 9(3):48–49, July–Sept. **1949.** 2 figs. **MH-BH**—Note on a device for direct recording of specific humidity vs. log of specific humidity. Operation of instrument schematically illustrated. *Subject Heading:* **Humidity instruments.**—*M.R.*

4–21 551.508.71

Conover, John H., **Tests and adaptation of the Foxboro dew-point recorder for weather observatory use.** *American Meteorological Society, Bulletin,* 31(1):13–22, Jan. **1950.** 9 figs., 2 tables, 12 refs. Abstract p. 13. **DWB, MH-BH**—Description of various types of dew point recorders leading to selection of the Foxboro "Dewcel," used in air conditioning, for tests at Blue Hill. Construction, operation, calibration, shielding, time-lag, scale-comparisons, etc. described and amply illustrated by reproduction of charts, calibration curves, schematic diagrams and photographs of equipment and installations. Comparison of three types of instruments shows that this lithium chloride type cell and the "Dewcel" recorder has many advantages: (1) less expensive, (2) needs attention only once in three months, (3) instrument is rugged, (4) accurate to +2°F., and (5) considerable lag resulting in stability of readings. It is, however, inaccurate at very low humidities. *Subject Headings:* **Dew point recorders, Hygrometers.**—*M.R.*

4–22 551.508.96

Lindquist, Rune, **The panoramic ionospheric recorder.** *Tellus,* 1(4):37–43, Nov. **1949.** 12 figs., 8 refs. Abstract p. 35. **DWB**—A new type ionospheric recorder was installed at the Askim Observatory near Gothenburg, Sweden in July 1948. The recorder, oscillator, transmitter, antenna system, receiver, relay, time-base indicator and records are described and illustrated. Five sample records are reproduced, showing varying degrees of disturbances. Very good records are obtained in polar regions which are subject to great fluctuations in height and stability of ionospheric layers, because of short sweep time. *Subject Headings:* **Ionospheric recorder, Ionospheric layers.**—*M.R.*

SYNOPTIC ANALYSIS AND FORECASTING

4–23 551.509(03)

Ham, C. J. van der, **De terminologie der weersverwachtingen.** [The terminology of the weather forecast.] *Hemel en Dampkring,* 48(1):10–16, Jan. **1950.** 5 figs., maps, tables. **MH-BH**—Precise definitions of expressions used in Holland for forecasts of wind direction, wind speed (knots, km./h. and Beaufort), gales or storm warnings in various sections of Holland, cloudiness, precipitation, temperature, visibility and thermals. Also meaning of terms designating localities or percentages of a region affected, with illustrative maps of Holland showing divisions for forecast purposes; definition of the terms "synoptic" and "aerological" and of time elements expressed by forecasts issued at various hours. *Subject Headings:* **Glossaries, Forecast terminology, Holland.**—*M.R.*

4–24 621.397:551.509.1

Frank, Marco, **Trasmissioni d'immagini e meteorologia.** [Transmission of images and meteorology.] *Rivista di Meteorologia Aeronautica,* 9(3):35–41, July–Sept. **1949.** 7 figs. Summary in Italian, French, English and German p. 35. **MH-BH**—The principles of television and facsimile transmission of pictures are reviewed and illustrated. Usefulness and limitations of the two systems for weather-map transmission are discussed. A letter to the editor from G. Dea and E. Rosini, *idem,* p. 46–48, entitled **Le teleimmagini nella meteorologia italiana,** [Telephotos in Italian meteorology] tells of the perfection of a system (by Capt. Frank) which will transmit a chart 25x30cm² (sic) in 12 to 20 minutes, and the necessary organizational adjustments such facsimile transmissions would entail. *Subject Headings:* **Television, Facsimile map transmission.**—*M.R.*

4–25 551.515:629.13:551.509.3

Crutcher, Harold L., Hunter, James C., Sanders, Robert A., and Price, Saul, **Forecasting the heights of cumulus cloud-tops on the Washington-Bermuda airways route.** *American Meteorological Society, Bulletin,* 31(1):1–7, Jan. **1950.** 7 figs., table, 7 refs., equations. Abtract p. 1. **DWB, MH-BH, DLC**—The vorticity index computed from 700 mb. charts was elected as the variable giving the highest correlation with the height of cumulus cloud tops on he Washington-Bermuda Airway. Basic sample was 454 observations of cloud tops made by ilots on this airway during 1945, and test data consisted of 210 similar observations during

1946 and 1947. Seasonal trend in slope of regression line was so pronounced that whe smoothed there was a close fit of the regression line to the original data for any given month and when test data were used, the correlation was still significantly high, indicating usefulness c this index as an objective forecasting tool. Methods of computing index, cloud top frequencies *Subject Headings:* **Vorticity, Cloud forecasting, Aeronautical meteorology, Objective fore casting, Methods of computation.**—*M.R.*

4–26 551.509.3(02

§Pack, S. W. C., **Weather forecasting.** London, Longmans, Green and Co., [1948] 192 p., 26 figs., (codes, symbols, tables in append.) **DLC**—A well illustrated and up-to-dat textbook on all phases of synoptic analysis and forecasting, complete with the latest inter national meteorological code specifications, conversion tables, pictures of the latest instrument used in observation, charts, energy diagrams and sample synoptic charts, some in color. C special interest are chapters on tropical meteorology, forecasting of fog, cloud, turbulence upper winds, icing on aircraft, etc. At least half of the book is concerned with the genera principles of meteorology which are necessary as a basis for map analysis and forecasting *Subject Headings:* **Map analysis, Forecasting, Textbooks.**—*M.R.*

4–27 551.509.

§Scherhag, Richard, **Beispiel einer stratosphärischen Steuerung.** [An example of strato spheric steering.] *Meteorologische Rundschau*, 1(9–10):287–290, March–April **1948.** 3 figs table. Summary in German and English p. 287. **DLC, DWB**—A discussion of the synoptic aerological method of analysis used since 1941 by the German Weather Service, with specia application to construction of charts of baric topography for the 96 mb. level. A particula situation (Dec. 5, 1942) is illustrated by means of charts of absolute and relative baric topog raphy and the associated surface chart. The steering current which shows up on the 96 mb chart gives the key to changes and shows a tongue of cold air which was related to an old occluded cyclone. *Subject Headings:* **Synoptic aerological studies, Weather map analysis Baric topography.**—*M.R.*

4–28 551.509.3:551.57

Showalter, A. K., **An approach to quantitative forecast of precipitation (III).** *America Meteorological Society, Bulletin*, 31(1):23–25, Jan. **1950.** 8 refs. **DWB, MH-BH**—Brie article suggesting revision of the author's quantitative precipitation formulas (*idem*, 25:13 142 and 276–288, April and Sept. **1944**), based on more recent work of Byers, Hull and Fletche *Subject Headings:* **Precipitation forecasting, Objective forecasting.**

4–29 551.509.3:551.515(265.

§Surand, P., **La prévision dans le Pacifique Sud.** [Forecasting in the South Pacific.] *L Météorologie*, 4e série, 14:84–90, April–June **1949.** 6 figs. Summary in French and Englis p. 84. **DWB**—Discussion and illustration of typical synoptic situations in different season and the associated weather; movements of air masses, monsoon and trade wind regime tropical cyclones and frontal storms in the vicinity of Australia, with a note on forecasting i the Indian Ocean. *Subject Headings:* **Weather forecasting, Cyclones, South Pacific.**—*M.R.*

4–30 551.509.317:551.515.4

§Similä, A., **Die aerologischen Gewittertendenzkarten.** [Aerological thunderstorm tendency charts.] *Tellus*, 1(4):18–23, Nov. **1949.** 4 figs., 6 refs., 8 equations. Abstract i English p. 18. Article in German. **DWB**—An objective method of forecasting probabiliti of thunderstorm occurrence using as criteria instability below the condensation level an instability in the cloud formation layer. Shower clouds are distinguished from thunderstorm clouds. Nomograms for determining instability factor and the humidity or dew point de pression influence are presented along with four sample thunderstorm tendency charts fo Europe (May 4–7, 1949). The latter designates areas where there is no tendency, sma tendency, moderate tendency and a strong tendency toward thunderstorms, indicating how on can follow the movements of these areas from day to day. *Subject Headings:* **Thunderstorm forecasting, Mathematical forecasting.**—*M.R.*

4–31 551.509.33

Kern, Helmut, **Die langfristige Witterungsvorhersage in der Tagespresse.** [The long range weather forecasts in the daily press.] *Meteorologische Rundschau*, 2(7–8): 234–235, July–Aug. 1949. **DWB, MH-BH**—Examples for winter 1947–1948 show need of caution; probabilities should be given. *Subject Headings:* **Long range forecasting, Dissemination of forecasts.**

4–32 551.509.33

Lönnquist, Olov, **The numerical prediction method for upper air profiles tried on some regular type profiles.** *Tellus*, 1(4):53–57, Nov. 1949. 6 figs., 2 tables, 3 refs., 2 equations. Abstract p. 53. **DWB**—Charney and Eliassen's numerical methods of predicting height of 500 mb. surface 24 hours ahead are modified and extended to provide for 48 hour predictions of certain simple wave patterns. Sinusoidal and quasi-sinusoidal profiles are discussed and illustrated, and attempts are made in the tests at superimposing two profiles on each other. Deepening can be accounted for in three different ways by this method. *Subject Headings:* **Mathematical forecasting, Upper air charts, Waves in the westerlies.**—*M.R.*

4–33 551.509.33:551.590.21:523.74

Baur, Franz, **Zurückführung des Grosswetters auf solare Erscheinungen.** [Origin of "broad-weather" in solar phenomena.] *Archiv für Meteorologie, Geophysik und Bioklimatologie*, Ser. A, 1(3–4):358–374, 1949. 3 figs., 2 tables, 19 refs. Summary in German, English and French p. 358–359. **DWB, MH-BH**—Rainfalls and pressures in temperate latitudes and severe winters in U. S. show a double oscillation in sunspot cycle. At spot maximum and minimum planetary circulation weakens; 1½ to 2½ years before, planetary circulation increases, subtropical highs move poleward and severe winters are fewer. Difference between areas of faculae and sunspots shows a correlated double variation owing to maximum of faculae 2 to 3 years before spot extremes. Faculae are rich in ultraviolet radiation and connection with surface pressure is probably through warming in upper convective layer. *Subject Headings:* **Long range forecasting, Solar influences, Sunspots.**—*C.E.P.B.*

STRUCTURE AND PHYSICS OF THE ATMOSPHERE

UPPER ATMOSPHERE

4–34 551.510.3

Brocks, Karl, **Uber vertikale Luftdichtezunahme in Bodennähe.** [On the vertical increase of density near the ground.] *Meteorologische Rundschau*, 2(7–8):227–229, July–Aug. 1949. 3 tables, 10 refs. Summary p. 227. **MH-BH**—With a temperature lapse of −3.42°C./100 m. air density increases upwards. From temperature observations author finds that this occurs regularly near noon; in S. England layer extends to height of 2 to 4 m. in winter and 10 m. in summer. In N. Egypt depth is 11 to 18 m. *Subject Headings:* **Atmospheric density, Micrometeorology.**—*C.E.P.B.*

4–35 551.510.4:551.510.535

Barbier, Daniel and Roach, F. E., **Sodium in the upper atmosphere.** *American Geophysical Union, Transactions*, 31(1):13–17, Feb. 1950. 4 figs., 3 tables, 6 refs., 6 equations. Abstract p. 13. **MH-BH**—Investigations to determine relation of sodium density in atoms per m^3 to height above earth's surface. It is assumed that the emission is a resonance phenomenon caused by solar radiation. Data obtained in the period just after astronomical twilight (solar angle 18° to 40° below horizon) or before dawn. Between 200 and 600 km. altitude, the slope of the curve of relation of log n to h_0 is much less than for 70–100 km., or for the entire atmosphere according to Grimminger. Either the latter is in error or the sodium comes from interplanetary clouds of sodium. This hypothesis would explain seasonal variations in intensity of sodium-D lines. *Subject Headings:* **Atmospheric composition, Upper stratosphere, Sodium spectra, Light of the night sky.**—*M.R.*

4–36 551.510.4

Ehmert, Hedwig and Ehmert, Alfred, **Zum Tagesgang des Ozons am Bodensee.** [C the daily variation of ozone at Lake Constance.] *Wetter und Klima*, 2(5–6):138–144, Ma June **1949.** 4 figs., table. **DWB**—Observations on shore at Friedrichshafen in 1940 showe regular nocturnal decrease of ozone, often to zero, but this was not found on the Pfander, 700 m above lake. Variation opposite to that of relative humidity. Marked increase with passag of fronts or onset of föhn. *Subject Headings:* **Ozone variations, Lake Constance, Switzerlan**

4–37 551.510.41:551.510.5

Lehmann, Paul, **Ozonunruhe und Luftschichtung. Ein Beitrag zu Currys Bioklimati** [Ozone variability and stratification of air. A contribution to Curry's bioclimatology *Meteorologische Rundschau*, 2(9–10):283–285, Sept.–Oct. **1949. DWB**—Ozone is brought fro stratosphere to ground by turbulence. Stable layers are barriers above which it accumulate vertical convection releases it. When a morning surface inversion 2,000 m. deep is broken u by the sun, ozone content increases from nil to considerable values in 7 to 26 minutes. Th explains susceptibility of rheumatics to descending currents. *Subject Headings:* **Atmospher composition, Ozone variations, Bioclimatology.**—*C.E.P.B.*

4–38 551.510.

§Brandtner, Erwin, **Der Staubfall im Westeuropa am 29. März 1947.** [The dustfall west Europe on March 29, 1947.] *Meteorologische Rundschau*, 1(7–8):222–226, Jan.–Fe **1948.** 7 figs., 8 refs., equations. Summary p. 222. **DLC, DWB**—By means of surface an upper air synoptic charts, the author shows the situation which lead to the transportation desert sand from northern Africa (Morocco) across Spain, France, western Germany and Be gium to the Netherlands. Isochrones and trajectories are also shown on a chart, and t dynamics of settling and particle-size distribution determined theoretically. The mechanis by which the dust is picked up at the source is also discussed and illustrated by schemat diagrams. *Subject Headings:* **Dust storms, Western Europe.**—*M.R.*

4–39 551.510.42:6

Eisenbud, Merril, Wanta, R. C., Dustan, Cyril, Steadman, L. T., Harris, W. B., and Wo B. S., **Non-occupational berylliosis.** *Journal of Industrial Hygiene and Toxicology*, 31(5):28 294, Sept. **1949.** 5 figs., 7 tables, 5 refs. Summary p. 293–294. **DLC**—In this study of pulmonary disease involving a unique factory effluent, beryllium, the past exposure of t neighboring community is estimated from recent atmospheric samples, and studies of prese and past plant operation and meteorological conditions. An estimate of the average conce tration ¾ mile distant from two sources, one 185 ft. and the other 33 ft. in height, is ma using concentration data obtained at other distances, and the diffusion equations of Sutto and Bosanquet and Pearson. Distinction is made in the application of these expressio between downwind samples of short duration and long-term samples at fixed stations. *Subje Headings:* **Atmospheric pollution, Medical meteorology, Turbulent diffusion.**—*Harry Wexler*

4–40 551.510.

Regula, Herbert, **Erforschung der Hochstratosphäre durch Schallwellen.** [Investigati of the high stratosphere by explosion waves.] *Meteorologische Rundschau*, 2(9–10):263–2 Sept.–Oct. **1949.** 5 figs. **DWB**—Zones of silence and abnormal audibility of explosions poi to a strong inversion at 35 to 40 km. This is confirmed by V-2 ascents. The location of zo of audibility exceeding 150 km., mainly to west in summer and east in winter, agrees wi summer and winter winds according to Scherhag (1948) from topography of 41 mb. surfa (ca. 22 km.), which are therefore considered to represent whole layer 20–45 km. Furth experiments should bring temperatures and winds up to 45 km. into discussion of synop problems. *Subject Headings:* **Structure of the stratosphere, Acoustical phenomena, Audibil zones.**—*C.E.P.B.*

4–41 551.510.

Regula, Walter, **Temperaturen und Winde in der oberen Stratosphäre.** [Temperatur and winds in the upper stratosphere.] *Meteorologische Rundschau*, 2(9–10):267–270, Sep

Oct. 1949. fig., table. **DWB**—From the White Sands V-2 ascent and luminous night clouds at 82 km. over Norway on June 30, 1934, author constructs chart of $9.1x10^{-3}$ mb. level over southern Norway. Clouds show wave formation indicating strong inversion at 82 km.; from this, various assumptions, and observations of luminous clouds and meteor trails up to 120 km. he constructs table for southern Norway. (excerpt):

Height, km.	22	47	82	109	123
Pressure, mb.	41	0.92	$9.1x10^{-3}$	$1x10^{-4}$	$1.8x10^{-5}$
Temperature °A.	230	320	180	265	—
Wind, m./s.	E 0	E 35	E 80	E 0	W 42

Above 82 km. mean wind is 122 m./s. from west, showing a marked reversal of horizontal temperature gradient. *Subject Headings:* **Upper air temperature, Upper air winds, Upper stratosphere.**—*C.E.P.B.*

4–42 551.510.53:551.591

*Waldram, J. M., **Measurement of the photometric properties of the upper atmosphere.** *Royal Meteorological Society, Quarterly Journal*, 71(309–310):319–336, July–Oct. **1945.** 10 figs., 5 tables, append. **DWB, DLC**—Discussion of the results of a number of experiments made to measure the optical properties of the air (up to 30,000 feet in clean air, and to 3,000 feet in industrial atmospheres). Nephelometer measurements and observations of the brightness of a searchlight beam exposed vertically were made in various seasons and on ship and shore. Polar Scatter Index, scattering coefficients and air-ground transmission variation with altitude shown on a large number of graphs, for both clean air and smoky air. At one time haze was observed up to 30,000 feet. Results of soundings of wind, temperature and humidity given for several of the series, and synoptic weather conditions for all of the series. *Subject Headings:* **Upper Troposphere, Visibility, Scattering, Turbidity, England.**—*M.R.*

4–43 551.510.535:551.506.7

Burkard, O., **Ionosphärenbeobachtungen im Polargebiet.** [Observations of the ionosphere in polar regions.] *Archiv für Meteorologie, Geophysik und Bioklimatologie*, Ser. A, 1(1):93–99, **1948.** 3 figs., table, 4 refs. Summary in German, English and French p. 93–94. **DWB, MH-BH**—Gives mean hourly values of critical frequency of microwaves reflected from F-layer for each month June 1944–April 1945 at Tromsö, N. Norway; maximum near noon and secondary maximum in early morning. Critical frequency much lower on magnetically disturbed than on quiet days. *Subject Headings:* **Ionosphere, Upper air observations, Tromsö, Norway.**—*C.E.P.B.*

MECHANICS AND THERMODYNAMICS

4–44 551.511

Berson, F. A., **Summary of a theoretical investigation into the factors controlling the instability of long waves in zonal currents.** *Tellus*, 1(4):44–52, Nov. **1949.** 3 figs., 13 refs., 6 equations. Abstract p. 44. **DWB**—Equations of motion integrated, assuming the changes of state to be polytropic, with growth of long waves due to energy of planetary waves in general circulation (westerlies). Derivation based on work of Rossby (1939) and Charney (1947), using Richardson's criteria as controlling factor in determining instability of system. The effect of vertical tilt in the pressure wave, assuming no tilt in the temperature wave, is discussed. The author deals with the advection factor (horizontal mass transport), associated with critical wave lengths, which are longer or shorter than those based on simplified model. *Subject Headings:* **Instability, Dynamics of the atmosphere, General circulation, Waves in the westerlies.**—*M.R.*

4–45 551.511

Dufour, L., **Sur la notion de la température potentielle.** [On the idea of potential temperature.] *Archiv für Meteorologie, Geophysik und Bioklimatologie*, Ser. A, 1(3–4):375–383, **1949.** 22 equations. Summary in French, German and English p. 375. **DWB, MH-BH**—Potential temperature is analyzed mathematically. Author then considers adiabatic and

isobaric potential temperatures and finds nonnegligible differences. Equivalent potential temperature of moist air also discussed. *Subject Headings:* **Thermodynamics of the atmosphere, Potential temperature.**—*C.E.P.B.*

4–46 551.511

Hassanein, S. A. M., **A wave pattern changing with time as a solution of the vorticity equation for non-divergent motion.** *Tellus*, 1(4):58–60, Nov. 1949. 5 refs., 10 equations. Abstract p. 58. **DWB**—Solution of vorticity equation showing that wave patterns which change with time must always be tilted from a meridional orientation. *Subject Headings:* **Vorticity, Dynamics of the atmosphere.**

4–47 551.511

Van Mieghem, Jacques, **Le principe d'extremum et la stabilité de certains états de mouvement de l'air atmosphérique.** [The principle of "extremum" and the stability of certain states of movement of atmospheric air.] *Archiv für Meteorologie, Geophysik und Bioklimatologie*, Ser. A, 1(3–4):347–357, **1949.** 4 refs., 26 equations. Summary in French, German and English p. 347. **MH-BH, DWB**—A particle of air which only changes state adiabatically, is in equilibrium in air in hydrostatic equilibrium if sum S of its specific enthalpy [heat content; internal energy + pressure x volume] and its potential energy per unit mass has a maximum or minimum ($dS/dz=0$). If minimum, hydrostatic equilibrium is stable; if maximum, unstable. This is extended to geostrophic motion by adding to S kinetic energy. When this sum is an extreme, a particle in a circular vortex is in equilibrium, stable or unstable. Treatment mathematical. *Subject Heading:* **Dynamics of the atmosphere.**—*C.E.P.B.*

4–48 551.511:551.551

Robitzsch, M., **Der virtuelle Wind.** [The virtual wind.] *Zeitschrift für Meteorologie*, 3(8–9):247–251, Aug.–Sept. **1949.** 4 figs., 3 tables. **DWB**—Author terms mean width of trace of a pressure-tube anemograph A'_m and mean speed V_m. Then kinetic energy of translation $E_t=\rho V_m^3 A/2$ and total kinetic energy is $E_t[1+.07R^2(A'_m/V_m)^2]$where R is gustiness reduction factor. Hence virtual wind V_v, a laminar flow which would give the same total energy, is $V_m\gamma[1+.07R^2(A'_m/V_m)^2]$. With an average gustiness factor of 1.4, turbulence contributes ca. 7% of energy, varying with direction. He calculates contribution at different heights, hours and months. Useful for thermodynamical problems. *Subject Headings:* **Thermodynamics of the atmosphere, Virtual wind.**—*C.E.P.B.*

4–49 551.511:551.577

Sawyer, J. S., **Cooling of air by rain as a factor in convection.** London, H. M. Stationery Office, **1949.** 11 p., 7 figs., 9 refs. ([Great Britain] Meteorological Office. Professional Notes, No. 96). At head of title: M. O. 420 p. **DWB**—Cooling of air by evaporation of rain in instability storms is an important factor in convection, causing descending air to warm at less than dry adiabatic. Cooled air descends and lowers local pressure surfaces by up to 250 ft.; resulting inflow of air raises surface pressure by up to 9 mb. The process may release as much energy as buoyancy of upward currents. Down currents deflected by hills influence development of storms. Most effective in tropics on borders of continents (Nor'westers of Bengal, Sumatras). *Subject Headings:* **Thermodynamics of the atmosphere, Rain, Convection currents.**

4–50 551.511:551.513.1

Van Mieghem, Jacques, **L'instabilité hydrodynamique et les perturbations du courant zonal d'Ouest.** [Hydrodynamic instability and perturbations of the zonal current from the west.] *Archiv für Meteorologie, Geophysik und Bioklimatologie*, Ser. A, 1(2):143–148, **1948.** **MH-BH**—From the work of Dept. of Meteorology, University of Chicago, 1946–1947, especially case of 17.1.47, author shows that instability in the tropospheric zonal current favors development of cyclones, and stability favors anticyclones. This bears on Parr's principle (1936) that lateral isentropic mixing intensifies as vertical stability increases. *Subject Heading:* **Dynamics of the atmosphere, Waves in the westerlies.**—*C.E.P.B.*

4–51 551.511:551.542.1

Wippermann, Friedrich, **Maximale Luftdruckgegensätze und Windgeschwindigkeiten als Funktion der Erdrotation.** [Maximum pressure contrasts and wind velocities as a function of the rotation of the earth.] *Meteorologische Rundschau*, 2(9–10): 257–258, Sept.–Oct. **1949.** table, 13 equations. **DWB**—Lettau (1947, 1948), ignoring curvature of isobars, found theoretical maximum pressure gradients and wind speeds which are occasionally exceeded. Introducing curvature term multiplies theoretical limits by 0.37 and increases discrepancy. Lettau's assumption of a harmonic distribution of wind speed along line from maximum to minimum pressure is rejected; the theoretical upper limit then agrees with observed limit. *Subject Headings:* **Mechanics of the atmosphere, Pressure gradients.**—*C.E.P.B.*

GENERAL CIRCULATION

4–52 551.513:551.543

Brier, Glenn W., **Changes in the Northern Hemisphere sea-level circulation in the 40-year period 1899–1939.** *American Geophysical Union, Transactions*, 29(6):789–795, Dec. **1948.** 17 figs., table, 5 refs. Abstract p. 789. **DWB**—Pressure indices, based on *Northern Hemisphere Sea Level Charts* for period 1899–1939 ,show a slight but real decrease in pressure for every month. Time between successive maxima and minima more stable than time of maxima or minima, and no trend evident in such time of occurrence. Twelve original charts of pressure changes between successive months for entire Northern Hemisphere are presented. *Subject Headings:* **General circulation, Pressure anomalies, Climatic changes, Northern Hemisphere.** —*M.R.*

4–53 551.513

Cressman, George P., **Some effects of wave-length variations of the long waves in the upper westerlies.** *Journal of Meteorology*, 6(1):56–60, Feb. **1949.** 8 figs., 7 refs., 22 equations. **DWB**—Application of Rossby's equation for motion of long waves in the upper westerlies, to forecasting displacement of troughs by means of four nomograms for convenient solution of the members of the fundamental equation. Fifty tests are made and results shown on scatter diagram which indicates deviation of observed from computed values of three day displacement. Test of acceleration term also shown graphically. Conclusion is that the use of group-velocity concept, applied to long waves in the atmosphere, improves prognostic accuracy. It is necessary to have data from distant places in order to show dimensions of more than one wave, and there must be a definite and persistent long-wave pattern throughout period. Problem is now to forecast changes in wave number before they actually begin. Results of this study show that if long-wave length increases upstream at initial moment, the eastward speed decreases with time and vice versa. *Subject Headings:* **General circulation, Waves in the westerlies.**—*M.R.*

4–54 551.513

Defant, A., **Neuere Ansichten über die allgemeine Zirkulation der Atmosphäre in mittleren Breiten.** [Recent views on the general circulation of the atmosphere in middle latitudes.] *Archiv für Meteorologie, Geophysik und Bioklimatologie*, Ser. A, 1(3–4): 273–294, **1949.** 9 figs., 18 refs., 13 equations. Summary in German, English and French p. 273–275. **MH-BH** —Summarizes Rossby's work at Chicago and Defant's own. In about 40°N., 5–15 km., is a band of very strong west winds (jet stream), maximum near tropopause, in or just south of a zone of maximum temperature gradient. In the jet, tropopause drops steeply northward and is often double. Below the jet is a frontal zone. The upper west wind develops quasi-stationary waves of length 50–120° which increase in amplitude to develop whirls, cold cyclonic to south, warm anticyclonic to north. Because of resonance these waves are most stable when length is integral part of earth's circumference. Observed structure agrees with constant flux of absolute moment of rotation (see fig. 7). *Subject Headings:* **General circulation, Waves in the westerlies, Jet stream.**—*C.E.P.B.*

4–55 551.513:551.509.31

†§Pogosian, Kh P., **Sezonnye kolebaniia obshchei tsirkuliatsii atmosfery.** [Seasonal variation in the general circulation of the atmosphere.] Leningrad, Izdat. Gidromet., **1947.**

88 p., 37 figs., 10 tables, 133 refs., 8 equations. (Tsentral'noe Institut Prognozov, Trudy 1(28) SSSR, Glavnoe Upravlenie Gidrometeorologicheskoi Sluzhby.) **DLC**—A comprehensive treatment of upper air analysis and forecasting based on charts of baric topography, studies of transformation of air masses, considerations of the dynamics and thermodynamics of the atmospheric circulation, and aerological soundings. A four page bibliography covers the important works in the USSR up to 1946 (54 items) and abroad up to 1944 (79 items). At least half of the work consists of charts, graphs and tables. Conversion tables and monthly mean upper air charts are appended (twenty-four charts of absolute and relative topography for the Northern Hemisphere). An interesting chapter on the aerological characteristics of circulation anomalies in the Northern Hemisphere takes up specific cases of extreme conditions and illustrates them with various baric and anomaly charts. *Subject Headings:* **General circulation, Pressure anomalies, Synoptic analysis, Computation tables, U.S.S.R.**—*M.R.*

4–56 551.513:551.577.2(969)

Solot, Samuel B., and Haggard, William H., **Relationships between large-scale atmospheric flow patterns and Hawaiian precipitation.** *American Geophysical Union, Transactions*, 29(6):796-802, Dec. **1948.** 7 figs., 5 refs. Abstract. **DWB**—In an attempt to forecast the seasonal or monthly rainfall for the Hawaiian Islands, Mr. Solot uses his famous *composite charts* of sea-level pressure anomaly over the Northern Hemisphere. It is shown that monthly rainfall extremes for various islands or aspects of the local orography are definitely associated with certain outstanding pressure-anomaly patterns over the north Pacific. Composite charts showing ideal circulation patterns for *drought* and *heavy rain* on *eastern* and on *western* slopes of Hawaiian Islands presented in connection with analysis of weather associated with various flow-types. Thus, according to Solot, if you can forecast the circulation anomaly you can forecast the rainfall anomaly for any given locality. *Subject Headings:* **Seasonal forecasts, Precipitation distribution, Atmospheric circulation, Pressure anomalies, Hawaii, North Pacific.**—*M.R.*

4–57 551.513:551.583

Petterssen, Sverre, **Changes in the general circulation associated with the recent climatic variation.** [Stockholm, Centraltryckeriet, Esselte AB, **1949.**] 6 figs., 3 tables, 3 refs., equations. "Reprinted from Glaciers and Climate, *Geografiska Annaler*, **1949.** H. 1–2:212–221." **DWB**—Statistical analysis of variations in the mean pressure distribution, the net zonal and meridional transport, the total meridional transport, the meridional exchange and the number of cyclones in various sectors of the North Atlantic and adjacent continental areas for the 40 year period 1899–1939 indicates that the warming in the Arctic during the last two decades was due to changes in the intensity of heat and cold sources resulting in some reduction in the zonal circulation, intensification of the meridional circulation, an increase in cyclonic activity and the meridional exchange of air in the Balkans, the Mediterranean and the Newfoundland areas. Whereas, pronounced tendencies in some of the above factors cannot be definitely determined, there is ample evidence of a decrease in horizontal temperature gradient from south to north, and of increasing northward flow of air toward the Arctic in the European sector (resulting in increased temperature and rainfall in southern Norway). *Subject Headings:* **General circulation, Climatic variations.**—*M.R.*

4–58 551.513:551.583

Willett, Hurd C., **Patterns of world weather changes.** *American Geophysical Union, Transactions*, 29(6):803–809, Dec. **1948.** 4 refs. Abstract p. 803. **DWB**—Correlations of pressure between zonal indices, and between zonal and meridional indices based on Northern Hemisphere Chart data, lead to the conclusion that irregular large-scale changes in the general circulation are too universal and too consistent to be produced by internal dynamic or thermodynamic instability, even though no significant lag-correlations can be found. By a process of elimination, then, the control must be external, such as an irregular solar influence like sunspots. Need expressed for continuation of efforts like analysis of daily Northern Hemisphere and Southern Hemisphere Charts, or world-wide monthly anomaly charts of pressure, temperature and precipitation. Also better indices of solar activity needed. *Subject Headings:* **Climatic variations, General circulation, Solar influences.**—*M.R.*

4–59 551.513:551.583

†Willett, Hurd C., **Long-period fluctuations of the general circulation of the atmosphere.** *Journal of Meteorology*, 6(1):34–50, Feb. **1949.** table, 24 refs. Abstract p. 34. **DWB, DLC, MH-BH**—In part I there is a comprehensive discussion of long-time records of sunspots; and of the studies made by Brückner, Sir Gilbert Walker, Hanzlik and Tannehill with respect to secular variations in climate or atmospheric pressure and sunspots. Part II consists of remarks on climatic variations in geological time based on works of C. E. P. Brooks, Simpson and Flint; and part III is on postglacial variations of climate as presented by C. E. P. Brooks, Huntington and Visher, and Flint. Stress is placed on effects of glaciation on atmospheric circulation patterns, and possible similarity of such secular changes to those occurring from month to month or even week to week at present. Solar variability, such as changes in sunspot number or size, is declared to be the only possible single factor of climatic control which could account for all these variations. *Subject Headings:* **General circulation, Climatic variations.**—*M.R.*

4–60 551.583.15:551.577.38:551.513.2

Weixlederer, R., **Die allgemeine Zirkulation im trockenen Winter 1948–49.** [The general circulation in the dry winter 1948–49.] *Wetter und Leben*, 2(3–4):49–52, [June]–July **1949.** fig., table, 3 refs. **DWB**—December 1948 to February 1949 was dry and mild in Austria. Pressure was more than 5 mb. above normal in south-central Europe and 10 mb. below at Jan Mayen; the increased westerly circulation brought mild temperatures especially at high levels, but the northward shifting of tracks of depressions kept precipitation small. *Subject Headings:* **Climatic variations, Droughts, General circulation.**—*C.E.P.B.*

4–61 551.513.7

Zimmerschied, Wilhelm, **Über den Zusammenhang zwischen der Niederschlagsmenge auf der iberischen Halbinsel und der Strenge der Winter in Mitteleuropa.** [On the relation between the rainfall of the Iberian Peninsula and the severity of the winter in central Europe.] *Meteorologische Rundschau*, 2(9–10):287–289, Sept.–Oct. **1949.** table. **DWB**—January precipitation at Madrid (1900–1947) has correlation +.775 with sum of daily negative mean temperatures at Berlin. At Santiago de Compostella in northwest, correlation is smaller because rain is orographic. *Subject Headings:* **Correlation coefficients, Climatic anomalies, Central Europe, Iberian Peninsula.**—*C.E.P.B.*

ATMOSPHERIC DISTURBANCES

4–62 551.515

Raethjen, P., **Zyklogenetische Probleme.** [Cyclogenetic problems.] *Archiv für Meteorologie, Geophysik und Bioklimatologie*, Ser. A, 1(3–4):295–346, **1949.** 21 figs., 23 refs., 38 equations. Summary in German, English and French p. 295–296. **MH-BH**—Author develops a theory of cyclogensis in a spreading "bubble" of cold air with cyclonic shearing. A frontal zone is a current with strong lateral temperature gradient; it ends in a "delta." If cyclonic shearing or discontinuity on cold side is large, a cyclonic whirl forms in the "delta." Whirling air presses outwards sucking down tropopause. Depressions of diameter 1,000 km. can develop from whirl of same size without loss to latter. Friction at surface and isentropic exchange along gliding surfaces maintain whirl at higher levels; exchange forms a field of stagnating barotropic air separated by frontal zones. *Subject Headings:* **Cyclogenesis, Tropopause.**—*C.E.P.B.*

4–63 551.515.13

§*†Defant, F., **Theorie der Steuerung und Spaltung von Bodendruckstörungen durch quasi-stationäre Höhendruckverteilungen.** [Theory of steering and partition of ground-level disturbances by quasi-stationary high level pressure distributions.] *Archiv für Meteorologie, Geophysik und Bioklimatologie*, Ser. A, 1(2):149–232, **1948.** 28 figs., 12 tables, 18 refs., numerous equations. Summary in German, English and French p. 149–150. **DWB, MH-BH**—An important paper. On the basis of earlier investigations into primary and secondary pressure waves, a theory of steering of surface disturbances is constructed; five types of situations are analyzed. When upper pressure wave moves W-E more rapidly than surface wave no steering

exists. With a quasi-stationary stratosphere system of large highs and lows and fast moving surface pressure waves a solution was evaluated for twenty days; surface disturbances undergo true steering. Steering clockwise with upper anticyclone, anticlockwise with upper cyclone, furthest S and weakest directly under upper low. N-S range of track proportional to amplitude of upper pressure wave but depends also on relation of periods of upper and lower waves. Partition is discussed by isallobars; this leads to a partial differential which gives exact time of partition. Theory agrees with observation. Finally surface pressure changes in whole region of a surface disturbance are calculated in three terms: stratospheric; mean temperature in troposphere; pressure effect of surface circulation; results agree with observations. Paper ends with eight rules for application to forecasting. *Subject Headings:* **Steering, Atmospheric circulation, Cyclonic disturbances, Waves in the westerlies.**—*C.E.P.B.*

4–64 551.515.2:551.577.32

Flohn, Hermann, **Klimatologische Homologien. (Tropische Orkane und Zyklonentätigkeit in der Westdriftzone.)** [Climatological homologies. (Activity of tropical hurricanes and cyclones in the zone of westerlies.)] *Meteorologische Rundschau*, 2(7–8):198–202, July–Aug. **1949.** fig., 3 tables, 22 refs. Summary in German and English p. 198. **MH-BH**—Discusses similarity in seasonal distribution of tropical cyclones in different oceans (and absence in S. Atlantic). The autumn maximum frequency increases cyclonic activity in temperate frontal zone and this explains autumn maximum of precipitation in N.W. Europe and N.W. America. *Subject Headings:* **Tropical cyclones, Cyclonic disturbances, Precipitation variations, Europe, North America.**—*C.E.P.B.*

4–65 551.515.2

Gordon, A. H., **Hurricanes at Barbados.** *Marine Observer*, 20(147):37–39, Jan. **1950.** fig. **DWB**—Popular account of the most famous and destructive of the 40 odd hurricanes which have visited Barbados at irregular intervals since 1674. None have occurred since 1898 (except a weak one on Sept. 1, 1949). Chart shows paths of hurricanes in north Atlantic during 1948 in respect to Barbados. *Subject Headings:* **Hurricanes, Barbados, West Indies.**—*M.R.*

4–66 551.515.4

Byers, Horace R., **Principal results of a comprehensive investigation of the structure and dynamics of the thunderstorm.** *Tellus*, 1(4):6–17, Nov. **1949.** 5 figs., 16 refs. Abstract p. 6. **DWB**—Report on extensive investigations of thunderstorm structure, made in Florida and Ohio, by means of airplane, radar balloon and surface networks. New model of thunderstorm in cumulus, mature and dissipating stage is presented. Also discussed and illustrated graphically are: entrainment mechanism, surface weather (rainfall, wind field, temperature, pressure, humidity), cellular development, electric fields, radar records, effect of prevailing air circulation, preferred areas for development and squall lines. The comprehensive final report on the Thunderstorm Project will be published by the U. S. Government Printing Office early in 1950. *Subject Heading:* **Thunderstorm structure.**—*M.R.*

4–67 551.515.4

§Malurkar, S. L., **Mechanism of thunderstorms in the tropics.** *National Institute of Sciences of India, Proceedings*, 15(4):161–177, May **1949.** figs., 20 refs. Summary p. 169–170. Discussion p. 164–169. **DLC**—After years of study of thunderstorms in India and a review of the classical theories (Normand, Sohoni and others) on the relation of wet bulb to frontal thunderstorms, the author comes to the conclusion that there are two types of thunderstorms: (1) the "frontal" storm which occurs on the poleward side of the upper air high pressure belt (2–4 km.), and which is characterized by cold air at high levels, warm moist air below, a "cold front" at the surface, (which does not, however, need to be a result of advection of any markedly dissimilar air mass) and by a sharp drop in wet bulb temperature during or after the storm; (2) the "heat" storm, occurring on the equatorward side of the upper air ridge of high pressure, on either side of the equator. Characterized by a return of wet bulb to original value after the thunderstorm. A series of charts for May 1947 are analyzed and presented as evidence. *Subject Headings:* **Thunderstorm structure, Tropical meteorology, Thunderstorm forecasting, India.**—*M.R.*

4–68 551.515.8

Schwerdtfeger, Werner, **Ein Beitrag zur Frage der Existenz der Hauptluftmassen.** [A contribution on the question of the existence of principal air masses.] *Meteorologische Rundschau*, 1(1–2):2–4, July–Aug. **1947.** 4 tables. **DWB** —Frequency studies of moisture content (vapor pressure) of air masses at Potsdam and Brocken for 51 and 38 years, respectively, show that there is a clear distinction (and a distinct clustering of values) between Arctic and subtropical air masses, but air masses from the middle latitudes show a wide scattering of values. *Subject Headings:* **Air masses, Potsdam, Hartz Mountains, Germany.**—*M.R.*

4–69 551.515.8:551.55

Faust, Heinrich, **Über einen Zusammenhang zwischen der Stärke der Spitzenbö bei Kaltfronten und dem beim Böenvorgang auftretenden plötzlichen Temperatursturz.** [On a connection between the strength of the peak squall of a cold front and the sudden fall of temperature at the squall passage.] *Meteorologische Rundschau*, 2(7–8):217–219, July–Aug. **1949.** 2 tables, 5 refs. **DWB, MH-BH** —Where a dry adiabatic gradient immediately precedes a cold front, the increase of wind speed in the squall in m./sec. is approximately twice the sudden fall of temperature in °C. Verified for two squalls. Also discusses horizontal squall vortex and weakening of squall at mountain stations. *Subject Headings:* **Cold fronts, Squalls.** —*C.E.P.B.*

4–70 551.515.8:551.509.317

§Kletter, Leopold, **Die Verwertung der Höhenwetterkarte zur Beurteilung der Wetterwirksamkeit von Kaltfronten in den Südalpen.** [The utilization of high level synoptic charts for the critical examination of the weather effectiveness of cold fronts in the southern Alps.] *Archiv für Meteorologie, Geophysik und Bioklimatologie*, Ser. A, 1(3–4):384–407, **1949.** 11 figs., 2 tables, 17 refs. Summary in German, English and French p. 384–385. **MH-BH** –Many cold fronts crossing Alps from north to south become very active, others die out. Behavior of cold currents crossing Alps is discussed with surface and 500 mb. charts. Active cold fronts with precipitation occur when South Alps lies ahead of a high level trough and upper winds are south of west; they die out through föhn effects with little or no precipitation when South Alps is in rear of high level trough and upper winds are north of west. Detailed prognostics are given, verified in 59 cold fronts or occlusions. *Subject Headings:* **Cold fronts, Weather forecasting, Upper air charts, Alps.**—*C.E.P.B.*

RADIATION AND TEMPERATURE

RADIATION

4–71 551.52:551.57

†Albrecht, Fritz, **Über die Wärme- und Wasserbilanz der Erde.** [On the heat- and water-balance of the earth.] *Annalen der Meteorologie*, 2(5–6):129–143, May–June **1949.** 16 figs., 19 refs. Summary in German and English p. 129. **DWB, MH-BH**—For the Indian and Pacific Oceans author calculates: (1) Total evaporation and precipitation for Feb., May, Aug., and Nov. Precipitation comes out 10% too high, attributed to use of island stations. (2) (i) Radiation balance at sea surface; (ii) heat transfer between air and sea; (iii) heat of evaporation (all in k. cal./cm²/month); (iv) incoming and outgoing energy balance over whole area; these agree within 1%. (3) Most of paper deals with heat balance of whole troposphere (over earth as a whole) with justification of assumptions (including "dry" stratosphere), illustrated by diagrams of components of in- and out-radiation. Plates give maps of (1) and (2) (i)–(iv) for Indo-Pacific for Feb. and Aug. and map of mean annual balance of energy in troposphere. A valuable paper. *Subject Headings:* **Heat balance, Water vapor, Troposphere, Indian Ocean, Pacific Ocean.**—*C.E.P.B.*

4–72 551.52:551.578.46

Reuter, Heinz, **Über die Theorie des Wärmehaushaltes einer Schneedecke.** [On the theory of the heat economy of a snow-cover.] *Archiv für Meteorologie, Geophysik und Bioklimatologie*, Ser. A, 1(1):62–92, **1948.** 5 figs., table, 27 refs., 70 equations. Summary in

German, English and French p. 62-65. **DWB, MH-BH**—Accepted constants of nocturnal radiation from a loose snow surface give rates of cooling of the surface 7–8 times those observed. Hence there must be considerable upward diffusion of heat by convection in the upper layers. Owing to permeability of snow to short-wave radiation, under steady sunshine maximum temperature occurs a few cm. below surface. Daily and annual periods of solar radiation are then introduced. The formulas for the periodic wave in soil can be applied to the annual wave in snow, but not to the daily wave. *Subject Headings:* **Terrestrial radiation, Snow cover.**—*C.E.P.B.*

4–73 551.521.11

Dirmhirn, Inge, **Die Sonnenscheinverhältnisse an der Biologischen Station Lunz.** [Sunshine conditions at the Lunz Biological Station.] *Wetter und Leben*, 2(7–8):152–159, Dec. **1949.** 5 figs., 6 tables. **DPL, DWB, MH-BH**—Owing to surrounding mountains, orographically possible sunshine much less than astronomical. Records 1927–1948 discussed. *Subject Headings:* **Sunshine, Austria.**

4–74 551.521.11:551.576.2(494)

Perl, Gertrud, **Über die Beziehung zwischen Tagesmitteln der Bewölkung und relativer Sonnenscheindauer in drei verschiedenen Klimagebieten der Schweiz.** [On the relation between the daily means of cloudiness and relative sunshine duration in three different climatic regions of Switzerland.] *Archiv für Meteorologie, Geophysik und Bioklimatologie*, Ser. B, 1(1):75–92, **1948.** 5 figs., 6 tables, 8 refs. Summary in German, English and French p. 75. **DWB, MH-BH**—Per cent of possible duration of sunshine compared with daily mean cloud amounts of 0, 1 . . . 10 tenths at Zürich, Davos and Lugano gave different results. Possibility of calculating sunshine from cloud amount limited. *Subject Headings:* **Sunshine, Cloudiness, Switzerland.**

4–75 551.521.11:71:551.584.5

Kaempfert, Wolfgang, **Zur Frage der Besonnung enger Strassen.** [On the insolation of narrow streets.] *Meteorologische Rundschau*, 2(7–8):222–227, July–Aug. **1949.** 6 figs., 10 tables, 5 refs., 4 equations. Summary p. 222. **DWB, MH-BH**—Gives diagrams and tables of diurnal variation of possible insolation in 50°N. on different dates on the road surface of narrow streets in different directions and on windows of houses, for different ratios of house height to road width. *Subject Headings:* **Insolation, City planning, Micrometeorology.**—*C.E.P.B.*

4–76 551.521.14:551.576

Fritz, Sigmund, **Measurements of the albedo of clouds.** *American Meteorological Society, Bulletin*, 31(1):25–27, Jan. **1950.** 2 figs., table, 4 refs. **DWB, MH-BH**—Discussion of four flights made to determine albedo of upper surface of clouds, and quantitative results of these flights. Two of the flights were from Washington to Pittsburgh and two of them in Southern California. The planes flew at elevations varying from 10,000 to 17,000 ft. and carried two Eppley pyrheliometers and a Brown recording potentiometer. Strato-cumulus clouds proved to have a higher albedo than alto-stratus. *Subject Headings:* **Albedo of clouds.**—*M.R.*

4–77 551.521.4:551.506.7

Roach, F. E. and Barbier, Daniel, **The height of emission layers in the upper atmosphere.** *American Geophysical Union, Transactions*, 31(1):7–12, Feb. **1950.** 7 figs., 6 tables, 4 refs. Abstract p. 7. **DWB, MH-BH**—Data on brightness of night sky in Mojave Desert made with a recording photometer which covers entire sky. Instrument and records are described briefly and illustrated. Corrections must be made for starlight (i.e. milky way) or auroral light if present. Two color methods of analysis makes allowance for nonatmospheric components. For several nights (1948–49) the O(I) 5577Å line was found at 110 km. and the Na(I) 5893Å at 310 km. *Subject Headings:* **Photometers, Light of the night sky, Emission layers, Sodium spectra, California.**—*M.R.*

TEMPERATURE

4–78 551.524.32:551.577.38:523.74

Visser, S. W., **De zonnevlekken en het weer.** [Sunspots and the weather.] *Hemel en Dampkring*, 48(1):1-9, Jan. 1950. 4 figs., 2 tables, 13 refs. **DLC**—An attempt to show by means of charts and scatter diagrams the relation between various periodicities in sunspot numbers and the ensuing droughts, cold and warm winters, magnetic disturbances, daily maximum and minimum temperatures (during the hot summer of 1947), disturbances in the F-layer, etc. Two hundred years of winter temperature data for Prague, De Bilt, Lancashire and New Haven are correlated with sunspot numbers. As usual, significant results are claimed. *Subject Headings:* **Sunspots, Abnormal winters, Correlations.**—*M.R.*

4–79 551.524.34:523.74(431)

*Scherhag, Richard, **Die Wintertemperaturen in Berlin und die Sonnenfleckenrelativzahlen.** [Winter temperatures in Berlin and sunspot relative numbers.] *Archiv für Meteorologie, Geophysik und Bioklimatologie*, Ser. A, 1(2):233–246, **1948.** 2 figs., 9 tables, 8 refs. Summary in German, English and French p. 233-234. **DWB, MH-BH**—Berlin winter temperature 1729-1948 twice smoothed showed 11-year period, maximum 1½ years before spot minimum, minimum at spot maximum. Amplitude over whole period only ½°C. but this is due to two types of variation, each of amplitude 1–2°C. but differing in phase; changes of type came ca. 1820, 1848 and 1895. More frequent cold winters anticipated in future. *Subject Headings:* **Temperature variations, Sunspots, Berlin, Germany.**—*C.E.P.B.*

4–80 551.524.37

Hogg, W. H., **Frequency of radiation and wind frosts during spring in Kent.** *Meteorological Magazine*, [London], 79(932):42–49, Feb. **1950.** 6 photos, 6 tables, ref. **DWB, MH-BH**—Calculates mean frequencies of various intensities of radiation frost and wind frost in March, April and May at 15 stations, classified into hilltop, hillside, plain and coast, 1919–1948. *Subject Headings:* **Radiation frosts, Freezes, England.**

4–81 551.524.7

Dewar, D., **Frequencies of tropopause temperatures over Larkhill from June 1945 to December 1947.** *Meteorological Magazine*, [London], 79(931):27-28, Jan. 1950. table. **DWB**—Seasonal frequencies by steps of 2°F. Summary:

	Dec.–Feb.	Mar.–May	June–Aug.	Sept.–Nov.
Mean °F.	−77.2	−71.0	−65.2	−73.3
Standard error of mean	1.5	1.3	1.0	1.1

Subject Headings: **Upper air temperature, Tropopause.**

4–82 551.524.7

Murray, R., **A note on the 1000–700-mb. thickness and the height of the freezing level over the British Isles.** *Meteorological Magazine*, [London], 78(930):349–351, Dec. **1949.** 2 tables. **DWB**—When 1,000-700 mb. thickness (t_7) is less than 9,500 ft., with certain provisos, height of freezing level above 1,000 mb. surface is $12.33t_7$−110,900 ft., standard error 460 ft. Correlation coefficient 0.945. *Subject Headings:* **Upper air temperature, Freezing level, Relative topography.**

4–83 551.524.7

*Nazarek, Alex, **The temperature distribution of the upper atmosphere over New Mexico.** *American Meteorological Society, Bulletin*, 31(2):44–50, Feb. **1950.** 3 figs., 2 tables, 11 refs., equations. Abstract p. 44. **DWB, MH-BH**—Mean temperatures in the region from 15 km. to 129 km. computed by applying the hydrostatic equation to pressure data obtained from V-2 rocket soundings over New Mexico. Results compare roughly with other recent vertical-temperature gradient models, except in the area around 100 km. where a marked irregularity

appears in the lapse rate, probably due to a transition layer of dissociation of molecular in atomic oxygen. Detailed results given in tabular and graphic form. *Subject Heading* **Upper air temperature, Rocket data, New Mexico.**—*M.R.*

4–84 551.524.7(

Ekhart, E., **Neue Beiträge zum Aeroklima Nordamerikas.** [New contribution to t aeroclimatology of North America.] *Geofisica Pura e Applicata*, 7(5–6):210–253, **1948.** figs., 5 tables, 27 refs. Abstracts in German and English. **DLC**—Further study, based c earlier records and studies from kite and APOB soundings, using radiosonde records up to t war. Includes consideration of mean temperatures at various altitudes by latitudes, longitude anomalies of pressure affecting inter-hemispherical circulation, correlations between tropo sphere and stratosphere temperatures and height of tropopause with its temperature. *Subje Headings:* **Upper air temperature, Tropopause, North America.**—*M.R.*

4–85 551.525.6:5

Trimmel, Hubert, **Temperaturbedingtes Massensterben von Fledermäusen in Höhle** [Mass killing of bats by temperature in caves.] *Wetter und Leben*, 2(1–2):13–16, [April May **1949. MH-BH**—Occurrences of weathered skeletons of bats in caves attributed unusually low temperatures during hibernation. *Subject Headings:* **Earth temperature Zoology.**

ATMOSPHERIC PRESSURE AND WIND

PRESSURE

4–86 551.541:551.543:551.55

†Courvoisier, P., **Über Luftdruckvariographen und Luftdruckschwankungen. Ein Zusammenfassung.** [On pressure variographs and pressure oscillations. A summary *Archiv für Meteorologie, Geophysik und Bioklimatologie*, Ser. A, 1(1):1–38, **1948.** 10 figs., refs., 24 equations. Summary in German, English and French p. 1–2. **DWB, MH-BH**— important survey. Part I describes functioning of various types, especially the leaki microbarograph, and analyzes their reactions to periodic oscillations of pressure. There is wide frequency band in which oscillations are correctly recorded. Part II deals very brief with standardizing. Part III gives a general survey of pressure oscillations from a fraction a second (sound waves) to years, set out in a spectrum on a log time scale. Wind structure analyzed and the rule (Amplitude x Frequency = Constant) discussed. Part IV enquir into the nature of pressure variations in the light of natural oscillations of the atmosphe according to Ertel, Haurwitz, etc., from 10 minutes to 200 days, compared with lengths actual observed. Ends with a number of outstanding problems and a comprehensive bibliograph *Subject Headings:* **Pressure variations, Wind structure.**—*C.E.P.B.*

4–87 551.543:0

Courvoisier, P., **Luftdruckschwankungen und Wetterfühligkeit.** [Pressure variation and weather sensibility.] *Archiv für Meteorologie, Geophysik und Bioklimatologie*, Ser. 1(2): 115–126, **1949.** fig., 14 refs. Summary in German, French and English p. 115–11 **DWB, MH-BH**—Author's survey of pressure oscillations [Archiv. Ser. A, 1, 1948, p. 1] analyzed, especially in the region of subacoustic frequencies. Oscillations of 0.5–120 sec showed no effects. Those of 2–16 Herz (0.5–0.06 sec.), ampl. .01 mm. Hg., gave reaction which were not quite comparable to föhn sickness. These are in the range of wind oscillation and the effects are probably not due directly to pressure, but knowledge is not yet sufficien *Subject Headings:* **Pressure variations, Medical meteorology.**—*C.E.P.B.*

4–88 551.515.8:551.54

Faust, Heinrich, **Darstellung von Luftdruckabweichungen im Bereich einer Böenfron** [Representation of pressure departures in the region of a squall front.] *Meteorologisch Rundschau*, 2(9–10): 270–276, Sept.–Oct. **1949.** 13 figs. **DWB**—A violent thundersquall o July 7, 1941 caused large pressure oscillations (slow fall, sudden rise, fall, rise) over weste Europe. Departures of barograms from smooth lines joining undisturbed parts gave hour "relative isobars" from 14–19h. showing complex structure of highs and lows, cold front an

two narrow squall lines. Tentatively explained and illustrated as the passage of a trough interrupted by a hump due to a labile disturbance. *Subject Headings:* **Squalls, Pressure variations, Western Europe.**—*C.E.P.B.*

4–89 551.543.3

Kletter, Leopold, **Die Aktivität des Azorenhochs im Herbst und Frühwinter 1948.** [The activity of the Azores high in autumn and early winter 1948.] *Wetter und Leben*, 1(12):353–357, March **1949.** 3 figs., 3 tables. **MH-BH**—Pressure at Ponta Delgada Oct. 23, 1948–Jan. 3, 1949 showed well marked oscillations of 72 and 14.4 days. *Subject Headings:* **Pressure variations, Azores.**

4–90 551.515.8:551.557:551.543.5

Miles, M. K., **A note on the relation between ageostrophic winds and isallobaric gradients.** *Royal Meteorological Society, Quarterly Journal*, 76(327):99–102, Jan. **1950. DWB**—Ahead of most warm fronts magnitude $|A|$ of ageostrophic wind at 900 mb. is given by $1.45I_M - 1$, or approx. $1.4I_M$, where I_M is measured isallobaric wind. *Subject Headings:* **Upper air winds, Pressure variations.**

WIND

4–91 551.551

Heidke, Paul, **Der Böigkeitsgrad.** [Degree of gustiness.] *Meteorologische Rundschau*, 2(9–10):285–287, Sept.–Oct. **1949.** table. **DWB**—(Summary of an unpublished paper.) Gustiness is defined as arithmetic mean change of wind speed. Approximations are given in the form cS^rM^{1-r} where S is range and M is mean speed (unit not stated); c and r depend on time interval. For 10-minute intervals on Fuess anemograms $c = .085$, $r = 0.33$; table given. Rather obscure. *Subject Heading:* **Gustiness.**—*C.E.P.B.*

4–92 551.551:533.6

Sutton, O. G., **Atmospheric turbulence.** London, Methuen, [1949]. 107 p., 4 figs., 2 tables, refs., index. (Methuen's monographs on physical subjects.) **DLC**—A small book which contains the essence of the series of lectures given by Mr. Sutton in Washington in November 1948. Highly theoretical but based on years of "field-testing" of theory. Chapters entitled: I. Turbulence, II. Meteorology of Lower Atmosphere, III. Early Theories and Applications to Large-Scale Phenomena, IV. Mixing Length and Statistical Theories of Turbulence, V. Diffusion Near the Ground, VI. Turbulence in a Variable Density Gradient. *Subject Heading:* **Turbulence.**—*M.R.*

4–93 551.551

Wieghardt, Karl, **Über Ausbreitungsvorgänge im Bodenwind.** [On diffusion processes in surface wind.] *Meteorologische Rundschau*, 2(7–8):196–198, July–Aug. **1949.** fig., 2 tables, 7 refs., 17 equations. **MH-BH**—Wind channel measurements of a temperature field behind a heat source are transferred to turbulent motion in a free atmosphere and represented by a nomogram. *Subject Heading:* **Turbulence.**—*C.E.P.B.*

4–94 551.553.12

†*Defant, Friedrich, **Zur Theorie der Hangwinde, nebst Bemerkungen zur Theorie der Berg- und Talwinde.** [On the theory of slope winds, with remarks on the theory of mountain and valley winds.] *Archiv für Meteorologie, Geophysik und Bioklimatologie*, Ser. A, 1(3–4):421–450, **1949.** 15 figs., 5 tables, 36 refs., 38 equations. **DWB, MH-BH**—An important paper. After A. Wagner (1938) the diurnal variation of winds in a narrow mountain valley with steep sides is shown in eight diagrams. Velocities parallel with slopes show maximum of 3.9 m./s. at 25–30 m. Mathematical treatment of a steady slope wind by L. Prandtl (Strömungslehre, 1942) based on potential temperature is shown to agree with observations in lowest 100 m.; turbulent and laminar flow give the same speeds. Theory is then extended to diurnal variation. Friction on rough and forested slopes is discussed and approximate calculations given of air transport and velocities vertical to slope in mountain and valley winds; results clarify mechanism. *Subject Headings:* **Mountain and valley winds, Slope winds.**—*C.E.P.B.*

4–95 551.553.6:519.

Dinkelacker, Otto, **Über spezielle Windverteilungsfunktionen.** [On special function of wind distribution.] *Wetter und Klima*, 2(5–6):129–138, May–June **1949.** fig., 3 tables, 2 equations. **DWB** -Examines characteristics of various expressions for frequency distribution based on fundamental form $y = x^k/e^x$, where x is wind speed and y frequency. Wind observations on and over Flanders coast are fitted by either $y = x^2/2e^x$ or $x^3/[6.4939(e^x - 1]$. *Subject Headings:* **Wind frequencies, Flanders, Belgium.**—*C.E.P.B.*

4–96 551.555.

Ekhart, E., **Zum Innsbrucker Föhn.** [On the Innsbruck Föhn.] *Meteorologisch Rundschau*, 2(9–10):276–280, Sept.–Oct. **1949.** 4 figs. **DWB**—Author gives diagram of daily duration of föhn in hours each year 1906-1947. Mean 500 hours in 67 days mostly in series; maximum March-April and October. Great secular decrease since 1911. Diagram constructed from pilot balloon ascents show mean föhn streamlines around Innsbruck at 1, 2, km. above mean sea level. At 1 and 2 km. they pass through and to right of Sil Valley to fan out and weaken in Inn Valley. A vertical section shows descent (20 m./s. or more) on south slope of Inn Valley, with great vertical divergence above valley floor (föhn wave) extending to high levels. Ascent of northern slope is turbulent. *Subject Headings:* **Föhn winds, Upper air winds, Innsbruck, Austria.**—*C.E.P.B.*

4–97 551.555.4(46

Fontserè, E., **La tramontane et le mestral de la Côte Catalane.** [The tramontana and mistral of the Catalonian Coast.] *Archiv für Meteorologie, Geophysik und Bioklimatologie*, Ser. B, 1(2):127–137, **1949.** 7 figs., 10 refs. Summary in French, English and German p. 127–128. **DWB, MH-BH**—A general study of the tramontana which descends the Albere Mountains in northeast Catalonia as a squally NNW wind and the cold dry mistral of the Ebro Valley. *Subject Headings:* **Tramontana, Mistral, Katabatic winds, Spain.**

4–98 551.555.6:551.515

§Kiviat, Lillian, **Lest we forget: January 1949 was the West's worst.** *American Meteorological Society, Bulletin*, 31(1):8–12, Jan. **1950.** 6 figs. **DWB, MH-BH**—A detailed account of local weather conditions and widespread damage accompanying the cold wave which prevailed west of the Mississippi during most of January 1949. Southern California had its first snow and severest freeze in years, and aside from blizzard conditions in the plains, the extremely low mean temperature in the northwest, hurricane winds and ice storms in many localities resulted in great hardship. A surface synoptic chart for Jan. 23, 1949, the temperature sounding at Oklahoma City on Jan. 9, 1949, the mean temperature anomalies for the United States during the week ending Jan. 25, 1949, and other illustrative material accompany this account. *Subject Headings:* **Blizzards, Cold waves, Western States.**—*M.R.*

4–99 551.555:551.515.1(495)(499.1

An der Lan, Hannes, **Meteorologische Besonderheiten der Ägäis.** [Meteorological peculiarities of the Aegean.] *Archiv für Meteorologie, Geophysik und Bioklimatologie*, Ser. B, 1(3–4):388–409, **1949.** 4 figs., 7 refs. Summary in German, English and French p. 388–389. **DWB, MH-BH**—Discusses the local katabatic winds ("white gusts") of the Greek and Turkish Coasts, including the "Vardar." The synoptic situations associated with them are discussed [not illustrated], especially the regeneration of winter depressions over the Aegean. Finally the well developed land- and sea-breezes of the Gulf of Athens are described. *Subject Headings:* **Vardar winds, Katabatic winds, Land and sea breezes, Greece, Turkey, Aegean Sea.**—*C.E.P.B.*

AQUEOUS VAPOR AND HYDROMETEORS

WATER VAPOR AND CLOUDS

4–100 551.571.7

Saha, N. K., **Distribution of water vapour in the atmosphere over Agra.** *National Institute of Sciences of India, Proceedings*, 14(5):249–262, May–June **1948.** 6 figs., 4 tables, 10 refs., 19 equations. Summary p. 262. **DLC**—Temperature and humidity data from Dine

meteorograph ascents over Agra, India are used to calculate the average vapor pressure up to 10 km. This "observed" lapse rate is compared with the theoretical lapse rate and the difference shown on a graph. Up to 10 km. this difference is very slight. At higher levels the observed vapor pressures are not in good agreement with the theoretical, but owing to poor humidity response in the very dry air at the tropopause and in the stratosphere, the true discrepancy cannot be very well determined. *Subject Headings:* **Upper air humidity, Agra, India.**—*M.R.*

4–101 551.574.1

Persano, Aldo, **I nuclei di condensazione.** [Condensation nuclei.] *Rivista di Meteorologia Aeronautica*, 9(3):3–20, July–Sept. **1949.** 10 figs., 6 tables, 21 refs., equations. Abstract in Italian, French, English and German p. 3. **MH-BH**—A comprehensive review of the principle theories on origin of nuclei of condensation as set forth by Aitken, Wigand, Köhler, Simpson, Findeisen, Dessens, Wright and others. Illustrations showing diameter and frequency distribution of various nuclei under varying conditions taken from Simpson, Wright and Dessens together with tabular data from similar sources. Origin of nuclei from evaporation of sea spray is suggested. Ionization and charges on particles discussed in detail. *Subject Heading:* **Condensation nuclei.**—*M.R.*

4–102 551.576.1:551.515.4

Barrett, E. W., and Riehl, Herbert, **Experimental verification of entrainment of air into cumulus.** *Journal of Meteorology*, 5(6):304–307, Dec. **1948.** 3 figs., 7 refs. **DWB**—Flights through cumulus in the Tropical Pacific Ocean during summer and fall of 1947 are described, including special instrumentation. No definite conclusions could be drawn regarding entrainment because of uncertainty of at least 2° due to dynamic effect on air but not on falling raindrops which, even at cloud top height, are cooler than surrounding air. Wet bulb effect also leads to uncertainty. As effect is always in one direction (excessive cooling of thermocouple), results show greater stability than is suspected, though even so, the lapse rate inside cumulus is superadiabatic (moist air). Mixing of air at various levels complicates picture, though in well-developed thunderstorms it is thought that most of the air in the cloud comes from near the surface. *Subject Headings:* **Cumulus clouds, Cloud structure, Entrainment, Tropical Pacific.**—*M.R.*

4–103 551.576(64)

Charl, P., **Les stratus d'Agadir.** [Stratus at Agadir.] *La Météorologie*, 4e série, 14:107–111, April–June **1949.** 4 figs., 2 refs. Summary in French and English p. 107. **DWB**—Charts (based on three years of data) show hourly and monthly frequencies of stratus with ceilings $\leqslant 400$ m. compared with time of sunrise and frequency of winds $\geqslant 7$m./s. Diurnal circulation scheme on days with and without stratus discussed and illustrated schematically with respect to airport, hills and sea. Advection stratus (ceilings 30–50 m.), although less frequent than radiation stratus, occurs $>20\%$ of the time in July, sometimes persists for hours and is very dangerous for aviation. *Subject Headings:* **Stratus clouds, Aviation climatology, Agadir, Morocco.**—*M.R.*

4–104 551.576.12:551.509.3

†Gifford, Frank, Jr., **Forecasting the height of formation of stratus clouds.** *American Meteorological Society, Bulletin*, 31(2):31–37, Feb. **1950.** 4 figs., table, 14 refs., 3 equations. Abstract p. 31. **DWB, MH-BH**—Eliminating cases of stratus which occur with precipitation or on a change from land to sea breeze, the author compiles and analyzes the data on the relation of wind speed and nocturnal cooling to height of stratus layer, and presents it in descriptive and graphical form with reference to the "roughness length" parameter. From these scatter diagrams one can see at a glance how often clouds might form before or below the ideal time or height as calculated from theoretical equations. Also some evidence of theoretical possibility of stratus forming at very low levels or on the surface with high winds (as in the Aleutians or at Cheyenne), is adduced. Humidity was not considered in this study. *Subject Headings:* **Cloud forecasting, Objective forecasting, Stratus clouds.**—*M.R.*

4–105 551.576.12:551.509.5

Handy, Burton, Jr., **Forecasting winter-time stratus at Kansas City, Mo.** *American Meteorological Society, Bulletin*, 31(2): 38-43, Feb. **1950.** 3 figs., tables, 6 refs. Abstract p. 38. **DWB, MH-BH**—From a scatter diagram showing cases of stratus (ceiling 1,500 ft. or less) and no stratus, with various temperatures and dew points, and another showing occurrences with various wind directions and speeds, a composite chart is compiled showing probability of stratus formation, and the 40% probability isopleth is used as the critical value for forecasting whether or not stratus will form between 0430 and 1230C at Kansas City. Cases falling between 20% and 60% are apt to be difficult to forecast; those above 60% are quite reliable for forecasting stratus; those below 20% almost sure bets for a no-stratus forecast. Method tested for six winter months giving accuracy of 76% and skill score chance of 32%, not as good as subjective Weather Bureau forecasts, but useful as a tool for doubtful cases. *Subject Headings:* **Cloud forecasting, Stratus clouds, Objective forecasting, Kansas City, Missouri.**—*M.R.*

4–106 551.576.1:551.51

Villa, Eduardo, **Diffusione del vapore nell'atmosfera. Nubi per diffusione.** [Diffusion of vapor in the atmosphere. Clouds formed by diffusion.] *Rivista di Meteorologia Aeronautica*, 9(3):21–34, July–Sept. **1949.** 2 figs., 5 refs., 11 equations. Abstract in Italian, French, English and German p. 21. **MH-BH**—Molecular diffusion in the atmosphere is compared with eddy diffusion and the theories developed and applied to the problem of the evaporation of fog and the rate of growth of clouds. The laws of turbulent diffusion in the lower layers over the sea are set up graphically and applications made to show that clouds can form by means of diffusion in homogeneous stable air masses (such as mT air). *Subject Headings:* **Cloud formation, Turbulent exchange, Turbulent diffusion.**—*M.R.*

RAINFALL

4–107 551.577.

*Croft, A. R. and Marston, Richard B., **Summer rainfall characteristics in northern Utah.** *American Geophysical Union, Transactions*, 31(1):83–93, Feb. **1950.** 6 figs., 4 tables, 6 refs. Abstract p. 83. Discussion, J. H. Dorroh, Jr., idem, p. 93–95. **MH-BH**—Depth-area and intensity-area data of rainfall in summer cloudbursts over the Wasatch Mountains analyzed by means of detailed tables, graphs and charts. Twelve outstanding cases cited and intensity characteristics shown by five minute periods. Rates at mountain stations compared with those at valley stations, and ratio of five minute to thirty minute rates, give evidence that at mountain stations the five minute rates are much greater in proportion to thirty minute rates than in valleys. Discussion by J. H. Dorroh, Jr. of the Soil Conservation Service, emphasizing fact that not enough moisture is available at these high elevations to maintain intense rainfall for more than a few minutes (up to ½ hour). *Subject Headings:* **Precipitation distribution, Thunderstorm rainfall, Flash floods, Utah.**—*M.R.*

4–108 551.577.2(74

McAleer, John B. and Knox, Charles E., **Annual rainfall and runoff in New England.** *American Geophysical Union, Transactions*, 29(6):903–908, Dec. **1948.** 3 figs., table, 5 refs. Abstract p. 903. **DWB**—Data from 160 stream gaging stations and 300 precipitation stations in the Connecticut and Merrimac River Basins are analyzed and detailed isoline charts prepared for rainfall and runoff in this area (most of New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut). Relation between rainfall and runoff, waterloss by evaporation transpiration, and [supposed] altitude effect calculated. Authors suggest use of these new refined charts for forecasting storm rainfall in terms of percentage of normal seasonal or annual rainfall, making the forecast generally applicable to varying orography and to areal calculations of rain and runoff. *Subject Headings:* **Precipitation distribution, Runoff, Connecticut Basin, New England.**—*M.R.*

4–109 551.577.2(691

Surand, P., **Répartition de la pluie au cours de la journée à Tamatave.** [Daily distribution of rain at Tamatave.] *La Météorologie*, 4e série, 14:91–100, April–June **1949.** 4 figs.

Summary in French and English p. 91. **DWB**—Based on hourly observations of rainfall for 12 years (1932–1944), monthly curves are plotted showing the hourly variations; regular in March through August and irregular the rest of the year. Hourly probabilities are calculated, plotted and discussed. A smoothed curve is drawn up for the year as a whole and presented together with curves for the maritime and for the continental components. Land-sea breeze effects are discussed in the conclusion. *Subject Headings:* **Precipitation variations, Diurnal variations, Madagascar.**—*M.R.*

4–110 551.577.32

Schröder, Rudolf, **Neue Untersuchungen zur Lage der Grenzen zwischen dem Sommer- und Wintermaximum der Niederschläge an deutschen Mittelgebirgen.** [New investigations of the position of the boundary between the summer and winter maximum of rainfall in the German Mittelgebirge.] *Meteorologische Rundschau*, 2(3–4):89–91, March–April **1949.** fig., 0 refs. **MH-BH**—Most of the region has a summer rainfall maximum, but there are scattered mountain areas with a winter maximum, especially in the south. *Subject Headings:* **Precipitation distribution, Germany.**

4–111 551.577.32(45)

Thraen, A., **Die jährliche Niederschlags-Periode in Mailand. Aus dem Rahmen von zwei 89 jährigen Säkularperioden** (1767–1944). [The annual rainfall period in Milan during two 89-year secular periods (1767–1944).] *Wetter und Klima*, 2(3–4): 92–96, March–April **1949.** fig., 3 refs. **DWB**—Annual variation 1767–1855 closely resembles 1856–1944, also 1829–1911, regarded as best sunspot period. Obscurely written. *Subject Headings:* **Precipitation variations, Milan, Italy.**

4–112 551.577.35

Müller-Annen, Hans, **Singularitäten von Monatstypen des Niederschlages in Gütersloh.** Singularities in monthly rainfall types in Gütersloh.] *Annalen der Meteorologie*, 2(3–4):86–91, March–April **1949.** 4 tables, 4 refs. Summary in German and English p. 86. **DWB**—Continuation of two papers in *Annalen der Meteorologie*, 1948. Months were divided into dry, wet and normal, and daily rainfalls smoothed. Counting peaks gave mean periodicities of 5.2–6.4 days [these may be introduced by the method of smoothing]. Further smoothing over seven days showed periodicities of 12–13 days. The distribution of maxima and minima is discussed and some regularities found. *Subject Headings:* **Precipitation variations, Periodicities.**—*C.E.P.B.*

4–113 551.577.36:551.515(262)

Reichel, Eberhard, **Die Niederschlagshäufigkeit im Mittelmeergebiet.** [Rainfall frequencies in the Mediterranean region.] *Meteorologische Rundschau*, 2(5–6):129–142, May–June **1949.** 13 figs., 2 tables, 29 refs. Summary p. 129. **DWB**—The paper opens with monthly statistics of various "dynamic processes" averaged by districts (depressions on various tracks, bora, scirocco, strong winds, föhn). Charts are given of mean number of raindays in seasons, year and alternate months. The distribution is discussed in light of dynamic processes and of Azores divergence and Arabian-Indian convergence. Relations are clearest in winter; in summer distribution is zonal and in other seasons transitional. *Subject Headings:* **Precipitation frequencies, Atmospheric circulation, Mediterranean.**—*C.E.P.B.*

4–114 551.578.11

Chapman, Gordon, **Size of raindrops and their striking force at the soil surface in a red pine plantation.** *American Geophysical Union, Transactions*, 29(5):664–670, Oct. **1948.** 4 figs., table, 12 refs. Abstract p. 664. **DWB**—Results contrary to popular opinion, indicate that temporary interruption of falling raindrops in showers of less than two inches per hour does not decrease the speed of impact of such drops on the soil. Kinetic energy of rain on soil surface calculated and found to be greater with forest cover than in open field, probably due to the increased number of drops of large diameter (as found by flour-pellet method). *Subject Headings:* **Raindrop size distribution, Forest influences, Soil erosion.**—*M.R.*

4–115 551.578.

*Horton, Robert E., (arr. by Richard Van Vliet), **Statistical distribution of drop sizes an the occurrence of dominant drop sizes in rain.** *American Geophysical Union, Transaction* 29(5):624–630, Oct. **1948.** 5 figs., 4 tables, 8 refs., 6 equations. Abstract p. 624. **DWB**— The author analyzes and compares data on drop size distribution obtained by Laws, Landsber Neuberger, Lenard and Bentley and attempts to show that such distribution would follow fro the thunderstorm model which he has developed. Suspension velocity, volume and domina drop sizes studied for rain, snow, sleet and hail. Evidence exists that sizes are significant often multiples of dominant size, indicating (as Defant suggested) coalescence in falling uniform speed. *Subject Headings:* **Raindrop size distribution, Rain formation.**—*M.R.*

SNOW

4–116 551.578.

Rossmann, Fritz, **Über die Entstehung der Schneeflocken.** [On the formation of snow flakes.] *Meteorologische Rundschau*, 2(1–2):34–37, Jan.–Feb. **1949.** 6 refs. Summary German p. 34. **MH-BH**—The study of very large snowflakes suggests that the hundreds thousands of small particles composing them have not come together mechanically in fallin but are brought together by electric forces. Most particles have Coulomb forces betwee opposite charges due to dipolar effects. This also accounts for the dendritic crystalline stru ture. *Subject Heading:* **Snowflake formation.**—*C.E.P.B.*

4–117 551.578.46:551.524.4(43

†Steinhauser, F., **Die Schneehöhen in den Ostalpen und die Bedeutung der winterliche Temperaturinversion.** [Snow depths in the eastern Alps and the importance of the wint temperature inversion.] *Archiv für Meteorologie, Geophysik und Bioklimatologie*, Ser. 1(1):63–74, **1948.** 2 figs., 3 tables, 16 refs. Summary in German, English and French p. 6 64. **MH-BH**—Mean maximum depth of snow increases by ca. 10 cm. per 100 m. height up 1,000 or 1,100 m. above sea level. At this height, except on eastern slopes, there is a sha decrease of depth, above which increase begins again at an increasing rate. This is associate with a marked winter inversion and decrease of fog at 1,000 to 1,100 m. *Subject Heading* **Snow cover, Temperature inversions, Austria.**—*C.E.P.B.*

4–118 551.578.4

Carpenter, Archer B., **North American winter of 1948–49; heavy snow in the intermounta region.** *Weather*, 5(2):49–51, Feb. **1950. DWB**—January and February 1949 were mo severe in history of Rocky Mountain Region. At Salt Lake City all-time daily, monthly an seasonal records for snowfall, snow depth, snow duration and low temperatures were broke A day-by-day account of emergencies, as cited in the press, is given. *Subject Heading* **Abnormal winters, Snowstorms, Salt Lake City, Utah.**

4–119 551.578.4

*Work, Robert A., **Snow-layer density changes.** *American Geophysical Union, Tran actions*, 29(4):525–545, Aug. **1948.** 18 figs., 10 tables, 9 refs. Abstract p. 525. Discussion b Forrest L. Rhodes p. 545–546. **DWB**—A highly analytical and detailed study of data ob tained near Crater Lake, Oregon, (elev. 6,450 ft.) during 1940–1941. Tables and curves sho lateral and vertical density in relation to time, depth, overburden, current weather, ice layer etc. Conclusions were: rain falling on light shallow snow passes through, but on deep fairly dense snow is retained. Snow density is extremely variable and cannot be predicte accurately from samples taken elsewhere. Settling and density increase is continuous bu more rapid at first. Melting occurred mostly at the surface, but was not constant per degree day of temperature above 32°F. Frost penetrates over 24 inches to freeze earth beneath an light penetrated 35 or 40 inches of dense snow to form chlorophyll in new grass. *Subje Headings:* **Snow cover, Snow density, Cascade Mountains, Oregon.**—*M.R.*

HYDROMETEOROLOGY

4–120 551.579

Benton, George S., Blackburn, Robert T., and Snead, Vernon O., **The role of the atmosphere in the hydrologic cycle.** *American Geophysical Union, Transactions,* 31(1):61–73, Feb. **1950.** 6 figs., 4 tables, 11 refs., 4 equations. Abstract p. 61. **DWB**—From pilot balloon and radiosonde data for North America, a quantitative estimate of moisture advection in different air masses is derived and applied to the classical or qualitative Hydrologic Cycle scheme for the Mississippi Basin. Precipitation, runoff, evapo-transpiration (according to air mass and season), and moisture transport into the Basin are discussed in detail and quantitative data shown in tables and charts. The conclusion is that only a small amount (20%) of the moisture in maritime air flowing over the Mississippi Basin is precipitated. Continental air masses pick up an additional 25% of moisture, but serve as sources for only a small proportion of the rainfall. Hence any modification of the evapo-transpiration surfaces would have little effect on total precipitation. *Subject Headings:* **Hydrologic cycle, Hydrometeorology, Air masses, Mississippi Basin.**—*M.R.*

4–121 551.579

†Reichel, Eberhard, **Hydrometeorologie.** [Hydrometeorology.] *Meteorologische Rundschau,* 1(15–16):493–500, Sept.–Oct. **1948.** numerous references. Summary. **DWB, DLC**—A detailed review of the major fields of interest and special problems of hydrometeorology, here defined as a peripheral area between meteorology and hydrology or hydrography. Included is a discussion of the necessary networks of stations, the water economy or hydrologic cycle, the role of glaciers and snow fields in high mountains, special problems on the relation between rainfall and runoff, ice in rivers and ground, and the most notable contributions of German meteorologists to the above problems. *Subject Headings:* **Hydrometeorology, Germany.**—*M.R.*

4–122 551.579.5

Albrecht, F., **Die Weiterentwicklung der Messtechnik des Wassergehalts des Bodens auf thermischer Grundlage.** [Further development of technique of measuring water content of soil by thermal methods.] *Archiv für Meteorologie, Geophysik und Bioklimatologie,* Ser. B, 1(2):149–155, **1949.** 4 figs., table, 4 refs., 4 equations. Summary in German, English and French p. 149–150. **MH-BH**—Water content of soil is related to heat capacity which can be found from thermal conductivity and thermal diffusivity. An instrument for measuring both these is described. *Subject Heading:* **Soil moisture.**—*C.E.P.B.*

4–123 551.579.5

*Göhre, K., **Der Wasserhaushalt im Boden (nach Messungen in Eberswalde).** [The water economy of the soil (from measurements in the Eberswalde).] *Zeitschrift für Meteorologie,* 3(1–2):13–19, Jan.–Feb. **1949.** 3 figs., 13 tables, 10 refs. Summary p. 13. **DWB**—Final report of investigations with a lysimeter. Precipitation at ground level 615 mm. (8.5% greater than that measured at 1 m.). Evaporation increased with precipitation; averages, bare ground 178 mm., grass plot 356, grass over high water table 706, pine, 450. Monthly and seasonal values given. *Subject Headings:* **Soil moisture, Lysimeters, Hydrology.**—*C.E.P.B.*

4–124 551.579.5

*Schubach, Karl, **Niederschlagssickerung durch verschiedene Böden.** [Percolation of precipitation through different types of soil.] *Meteorologische Rundschau,* 1(11–12):351–354, May–June **1948.** fig., 2 tables, refs. Summary p. 351. **MH-BH, DWB, DLC**—Research at the Agro-meteorological Experiment Station at Giessen since 1937 discussed, with special reference to measurements of the amount of rainfall lost by seepage in different types of soil (by means of lysimeters which have been used since 1929 in Germany). Lysimeter data for the spring months of 1947 presented in a table, and the relation of weather conditions to seepage in various soils, for the period Nov. 1946 through June 1947 in a composite graph. *Subject Headings:* **Lysimeters, Percolation, Agricultural meteorology, Germany.**—*M.R.*

CLIMATOLOGY AND BIOCLIMATOLOGY

CLIMATOLOGY

4–125 551.58(267):778

Mondain, J., **Photographies aériennes et climat à la Réunion.** [Aerial photographs and climate at Réunion.] *La Météorologie*, 4e série, 14:111–112, April–June **1949. DWB**—Effect of cloudiness, visibility, haze layers and showers during the warm and the cool season, in respect to number of hours of good weather for aerial photography. Turbulent trade wind conditions are worst; the best weather is during the warm season, or rather that portion which is a transition between cyclonic periods and monsoon periods: namely March to May and September to October. *Subject Headings:* **Aerial photography, Aviation climatology, Réunion Island, Indian Ocean.**—*M.R.*

4–126 551.582(57)

Flohn, Hermann, **Zum Klima der Kältepole der Erde.** [On the climate of the cold pole of the earth.] *Meteorologische Rundschau*, 1(1–2):25–26, July–Aug. **1947.** table, bibliog. **DLC, DWB**—Monthly mean temperature and wind data for Verkhoiansk for the period 1883 to 1929 are presented and compared with five years of mean temperature data for Oimekon. Verkhoiansk has long been considered to be the "cold pole" of the earth, but since 1929 the consensus of opinion is that Oimekon, which lies in the upper reaches of the Indigirka, 650 km. southeast of Verkhoiansk and 450 km. from the Okhotsk Sea (lat. 63°10′N., long. 143°15′E., elev. 754 m.) in 10–12 km. wide valley surrounded by 2,000 m. high ranges, holds that distinction. Since during the winter of 1929–1930 the mean temperature at Oimekon was 3.4°C. lower than at Verkhoiansk it was assumed that the same relation would hold true over a long period of years. *Subject Headings:* **Climatology, Climatic extremes, Verkhoiansk, Oimekon, Siberia, U.S.S.R.**—*M.R.*

4–127 551.582:551.468

Nash, Carroll Blue, **Environmental characteristics of a river estuary.** *Journal of Marine Research*, 6(3):147–174, **1947.** 4 figs., 5 tables, 12 refs. **DWB**—Study of Patuxent River, Maryland. Twenty-one permanent stations visited during 1936–1939, and 1944–1946. Constant recording air and sea thermograph at end of pier at Solomons where water is two meters in depth. Air thermograph under end of pier five feet above mean river level. Pier extends 740 feet into Patuxent River. Includes discussion of air, surface and bottom temperatures by months and seasons; density, salinity, light penetration, water level, etc. Temperature range is greatest upstream and least in the vicinity of the entrance to Chesapeake Bay. Water is cooler than air from late January to late June, and is warmer than the air by 0.5°C. from July through mid-January. *Subject Headings:* **Climatology, Oceanography.**—*M.R.*

4–128 551.582(495)

†*Philippson, Alfred, **Das Klima Griechenlands.** [The climate of Greece.] Bonn, Ferd. Dümmlers, **1948.** 238 p., tables, 6 charts, 99 refs. **DWB, MH-BH**—A comprehensive analytical study of the climate of Greece and neighboring islands, consisting mainly of a review of the material gleaned from a large number of sources, but arranged systematically according to the following scheme: (A) History of Literature on Climate of Greece; climatic regions; (B) Pressure and Wind; (special winds: such as the etesien, föhn, etc.), flow of air and sea currents; (C) Temperature (frost, ice, earth temperature, radiation, mean and extreme temperatures, diurnal, annual and secular changes); (D) Water in the Atmosphere; water vapor, cloudiness, turbidity, rainfall, rainy days, intensity, yearly variations, thunderstorms, hail, snow, snow cover, dew; (E) The Mountain Climates of Greece; (F) The Seasons; (G) Climatic Changes in Historical Time; (H) Climatic Zones; (I) Climate and Man. Tabular data is arranged and discussed by elements and by regions. Numerous verbal descriptions of weather are quoted. Section on effect of climate on human health and activities is quite extensive. *Subject Headings:* **Climatology, Greece.**—*M.R.*

4–129 551.582:551.513(495)

Piper, Horst, **Winterwetter im griechisch-ägäischen Raume.** [Winterweather in the Greek-Aegean region.] *Meteorologische Rundschau*, 1(11–12):346–348, May–June **1948.**

Summary p. 346. **DWB**—A descriptive analysis of air mass boundaries, regeneration and deepening of cyclones, and outbreaks of cold and warm air over Greece and the Aegean, especially during the unusually cold winter of 1941/1942. *Subject Headings:* **Abnormal winters, Cold waves, Air mass movements, Greece.**—*M.R.*

4–130 551.582(62)

Sutton, L. J., **The climate of Egypt.** *Weather*, 5(2):59–62, Feb. **1950.** photo, table. **DWB**—General discussion of seasons in Egypt, together with account of usual and unusual temperature, humidity, rainfall and weather conditions (storms, snowfall, flash floods, etc.) A brief table gives comparative data for 10 stations in Egypt. *Subject Headings:* **Climatology, Egypt.**

4–131 551.582.1:634(45)(495)

Tschermak, Leo, **Klima und Wald in Italien und Griechenland.** [Climate and forest in Italy and Greece.] *Wetter und Leben*, 2(7–8):145–152, Dec. **1949. DWB, MH-BH**—Small rainfall and dry summer, and the agricultural practices which they induce, are unfavorable to forests, which are diminishing. *Subject Headings:* **Climatology, Forests, Italy, Greece.**

4–132 551.583.2

Post glacial climatic change. *Nature* [London], 163(4135):160–161, Jan. 29, **1949. DLC**—Discussions at meeting of Royal Meteorological and Royal Astronomical Societies on Dec. 15, 1948, where problems of climatic changes were discussed by Mr. Hoyle, Prof. Godwin, Prof. Gordon Manley, Dr. Ångström, C. E. P. Brooks, Mr. Schove, Prof. Sheppard, and others. Theories of cosmic dust, changes in orbits, tides in the oceans, etc., presented, but belief is that variations of solar radiation are fundamental to changes in climate of any duration. *Subject Headings:* **Climatic variations, Paleoclimatology.**—*M.R.*

4–133 551.583.7(04)

Gamow, George, **Origin of the ice.** *Scientific American*, 179(4):40–45, Oct. **1948.** illus. **DLC, DWB**—Correlation of astronomical and geological data leads to theory that the glacial periods resulted from variations in the earth's motion. Warming for next 20,000 years, followed by glaciation about 50,000 A.D. predicted. Warm winters and cold summers considered responsible for Northern Hemisphere glaciation. Hot summers and cold winters lead to deglaciation. Popular article well illustrated. *Subject Headings:* **Paleoclimatology, Popular articles.**—*M.R.*

BIOCLIMATOLOGY

4–134 551.586:61

Curry, Manfred, **Bioklimatik, die Steuerung des gesunden und kranken Organismus durch die Atmosphäre.** [Bioclimatics, the control of healthy and sick organisms by the atmosphere.] Riederau/Ammersee, American Bioclimatic Research Institute, **1946.** 2 vol., 1534 p., 810 figs., 32 plates. **DWB**—An elaborately printed and bound edition, with many excellent illustrations. Takes up systematically the various weather elements that might possibly affect the human organism, and the effect of these elements on various disorders as well as on the healthy individual. The thesis is advanced, and permeates all of the discussion, that there is a component in the atmosphere, called by the author "Aran" similar to, but more powerful than ozone, which is the most active agent of the atmosphere in promoting or disturbing health or well-being. The author classifies most individuals into two types: the "W" or warmfront sensitive type, and the "K" or coldfront sensitive type. The types are determined by elaborate questioning and then through further questioning, generalizations on the effects of weather changes on these types are made. Hundreds of photographs are included of people suffering from cancer, tuberculosis, ulcers of the stomach, diabetes, cirrhosis of the liver, gallstones, epilepsy, bronchial asthma, arthritis, etc., including manic-depressives, actors, famous physicians and other "types." He takes up the effect of weather and climate, especially of "Aran" on sleep, dreams, libido, irritability, headaches, etc.

There is a great deal of factual meteorological information, well illustrated by records, barograms, frontal charts, etc., but all pointed toward the theory which is based on a very generalized classification of human "types." The two volumes are divided into six parts or

46 chapters. **Part I** treats of the meteorological, physical and biological considerations; **Part II** of climatic elements and their effect on healthy persons; **Part III** the "types" of individuals and their reaction to weather changes; **Part IV** defines climate and advances the theory that "Aran" content is a sort of integration of all of the changes in weather or air masses, and goes into the distribution of Aran and other elements in the atmosphere of various physiographic locations (such as valleys, seashores, lakes, forests, cities, slopes of ranges, mines, etc.) and of many specific places used for resorts. **Part V** takes up the effect of the atmosphere on many diseases and on the various types. **Part VI** goes into the treatment of said diseases. Of course a great deal of space is devoted to föhns, their nature and effects. (In German.) *Subject Headings:* **Bioclimatology, Medical meteorology, Aran.**—*M.R.*

4–135 551.586:612

Auerswald, W. and Bornschein, H., **Untersuchungen über den Einfluss der operativen Temperatur auf Höhe und mittlere Streuung der Hauttemperatur der verschiedenen Körperregionen.** [Investigations into the influence of the operative temperature on the level and mean deviation of the skin temperature of various parts of the body.] *Archiv für Meteorologie, Geophysik und Bioklimatologie*, Ser. B, 1(1):102–107, **1948.** fig., 22 refs. Summary in German, English and French p. 102. **DWB, MH-BH**—Temperatures of breast, finger-joints, forehead, nose, etc., in rooms where temperature had been stabilized at temperatures of 25–19°C. shown, including mean deviation. Physiology of results discussed. *Subject Headings:* **Medical meteorology, Physiology.**—*C.E.P.B.*

4–136 551.586(09)

Philipsborn, Ernest von, **Bioklimatologie in alten Griechenland.** [Bioclimatology in ancient Greece.] *Meteorologische Rundschau*, 2(3–4):100–101, March–April **1949.** 5 refs. **DWB, MH-BH**—Author describes the views of the influence of weather on health given by Hippocrates and Meton, and in other works. *Subject Headings:* **Bioclimatology, History, Greece.**

4–137 551.586:551.510.4

Tichy, Hans, **Zu den Anschauungen von Curry über die Wetterwirkung durch Ozon und Ozonide.** [On the views of Curry ("Ärztl. Forschg., 1948, 5/6) on the weather effect of ozone and ozonide.] *Zeitschrift für Meteorologie*, 3(3):87–90, March **1949. DWB**—Begins with a historical introduction on the possible effect of atmospheric and electromagnetic microwaves on health. Curry thinks these are inadequate and turns to chemical effects of oxidizing substances ("arane") which explains many medical observations, including Tichy's. *Subject Headings:* **Medical meteorology, Bioclimatology, Atmospheric composition, Aran.**—*C.E.P.B.*

4–138 551.586:612

Spangenberg, Wolf W., **Über atmosphärischer Einflüsse auf den Menschen.** [On atmospheric influences on man.] *Zeitschrift für Meteorologie*, 3(1–2):43–46, Jan.–Feb. **1949.** 21 refs. Summary p. 43. **DLC**—By interrogating patients, author found three grades of sensitiveness to weather: (1) discomfort or reflex action of organs; (2) reaction with important secondary disturbances (rheumatism, aching of wounds, etc.); (3) illnesses provoked or increased by weather. Sensitiveness to weather can be acquired. It is increased by a long period of self-observation but decreased by work, especially mental work. *Subject Heading:* **Medical meteorology.**—*C.E.P.B.*

4–139 551.586:551.524:612.5

†Winslow, Charles-Edward Amory and Herrington, L. P., **Temperature and human life.** Princeton, N. J., Princeton University Press, **1949.** 272 p., 39 figs., tables, 151 refs. **DWB**—The results of years of basic research on respiration, metabolism and other problems of physiology related to adjustment of the human body to its environment have been presented systematically in this book for the benefit of air conditioning engineers and those interested in the effect of climate or weather on clothing requirements, disease, etc. There are seven pages of bibliography and a comprehensive author and subject index. *Subject Headings:* **Climate and health, Clothing requirements, Air conditioning.**—*M.R.*

4–140 551.588.4:551.571

*Rathschüler, Elisabeth, **Der Einfluss eines Wasserfalles auf die Luftfeuchtigkeit der Umgebung.** [Influence of a waterfall on the humidity of the neighborhood.] *Archiv für Meteorologie, Geophysik und Bioklimatologie*, Ser. B, 1(1):108–114, **1948.** 2 figs., 3 tables, 2 refs. Summary in German, English and French p. 108. **DWB, MH-BH**—Hourly values of humidity and vapor pressure 1.5 km. from a big waterfall in Krimml Valley, Salzburg, show, on fine days, R. H. higher by 7% at 2 h. and 14% at 14 h. than other places of same height. Vapor pressure is raised by 0.3 to 2 mm. *Subject Headings:* **Topographic effects, Humidity.**—*C.E.P.B.*

4–141 551.588.6:551.579

Burger, H., **Der Einfluss des Waldes auf den Wasserhaushalt.** [The influence of forests on the water economy.] *Vierteljahrschrift der Naturforschenden Gesellschaft in Zürich*, 93(1):76–78, March 31, **1948.** **DWB, MH-BH**—Half the forests of Switzerland have been destroyed since civilization began. In 1387 the first forest preserve was established. The paper treats on the relation between precipitation, runoff and evaporation; effect of leaves, moss, etc. on runoff; thunderstorms, ground water, springs, erosion, landslides, snowslides, floods, etc. *Subject Headings:* **Forest influences, Hydrology.**

PART II. SELECTIVE ANNOTATED BIBLIOGRAPHY ON HAIL

By: *Mary L. Rice and Malcolm Rigby*

EXPLANATORY NOTE

In choosing material for this bibliography, preference has been given to material of an analytical nature, to recent material and to material from sources outside the United States. No attempt has been made to include all articles reporting individual storms, especially in the United States. Anyone interested in this phase of the subject should see D–2.

The material in the bibliography is arranged chronologically under each of seven subject divisions, with the earlier works at the beginning of each division and the latest works at the end.

For a list of libraries, with their symbols, in which a work or periodical is located see p. iv.

The language of the article is in the language of the title unless otherwise noted. An entry that has not been located and checked is so indicated.

We wish to express appreciation for the assistance given by Dr. C. F. Brooks and Mr. Robert K. Souter, who offered valuable suggestions and allowed us to consult their more exhaustive lists of references (see items D–4 and D–244).

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BIBLIOGRAPHIES ON HAIL

D–1 551.578.7(016)

U. S. Signal Office, **Bibliography of meteorology. Part II Moisture.** Washington, **1889.** p. 316–366. **DWB**—Covers period from beginning of printing to 1881, supplement continues to close of 1887. Contains 701 items on hail; 122 in English. *Subject Headings:* **Hail, Bibliographies.**

D–2 551.578.7(016)

U. S. Works Progress Administration. [**Hail section of card catalog on meteorology,551.578.7–551.578.72. 1937.**] **DWB-MH-BH**—About 200 references compiled from material in 16 periodicals issued in the U. S. (14) and Great Britain (2). *Subject Headings:* **Hail, Bibliographies.**

D–3 551.578.7(016)

Great Britain. Meteorological Office Library. [**Subject catalog, section on hail. 1949.**] (Microfilm available.) Approximately 100 items with brief annotations in some cases. Material for years 1900–1935 classified under F1250, F1255; for years 1936–1949 classified under 551.578 to 551.578.73. *Subject Headings:* **Hail, Bibliographies.**

D–4 551.578.7(016)

Harvard University—Blue Hill Observatory Library. [**Bibliography on**] **hail.** [**1949.**] [13] p. Typed list compiled from card file and containing about 250 items. *Subject Headings:* **Hail, Bibliographies.**

HAIL (GENERAL)

D–5 551.578.7

Volta, Alessandro, **Sopra la grandine.** [On hail.] [Bologna? **1806.**] p. 125–190. **DWB**—*Subject Heading:* **Hail.**

D–6 551.578.7

†Russell, Rollo, **On hail.** London, Edward Stanford, **1893.** 224 p., 2 photos, refs. (in footnotes), append. **DWB**—Descriptions given of hailstorms all over the world; data included from observations of temperature, clouds and winds at high altitudes; connection between electricity and hail noted; various theories of hail summarized; conditions that favor hail formation and characteristics of hailstorms and hailstones described; development of a hailstorm traced; and the author's conclusions. *Subject Heading:* **Hail.**

D–7 551.578.7

Hann, Julius vonn, **Hagelwetter.** [Hailstorms.] (In his **Lehrbuch der Meteorologie.** 3rd. ed. Leipzig, Chr. Herm. Tauchnitz, **1915.** p. 708–725. 2 figs., 2 plates, table.) **DLC**—Comprehensive summary of knowledge on hail, hail structure, hail frequency, hail formation, hail occurrence up to date of publication of this edition. *Subject Heading:* **Hail.**

D–8 551.578.7

Talman, Charles F., **Hail and its half-brothers.** *Nature Magazine*, 4(4):197–202, Oct. **1924.** photos. **DLC**—Popular article dealing with characteristics of true hail, famous hailstorms, types of crops damaged, and methods of prevention. *Subject Heading:* **Hail.**

D–9 551.578.7

Ward, Robert DeCourcy, **The climates of the United States.** Boston, Ginn and Co., [1925]. p. 335–338., fig. **DLC**—Points out certain characteristics of hail: occurrence with thunderstorms, narrow area over which it falls and prevalence in spring. Reference to hail damage. Figure shows annual number of days with hail during the frostless season. *Subject Heading:* **Hail.**

D–10 551.578.7

Talman, Charles F., **Ice from the thunder clouds.** *Natural History*, 38(2):109–119, Sept. **1936.** **DLC**—Popular article. Kinds of hail, record hailstones, damage from hailstones, quaint machines to prevent hail, and hailstorms that have played a part in history. *Subject Heading:* **Hail.**

D–11 551.578.7

Bougnol, M., **Note sur le grêle en Afrique Occidentale Française.** [Note on hail in French West Africa.] Publ. C. Etudes A.O.F., Paris, No. 3:63–68, **1937.** (Unchecked.)—*Subject Headings:* **Hail, French West Africa.**

D–12 551.578.7

Kent, Leslie E., **Probable fossil hail impressions in Natal coal measures (middle Ecca series).** *Nature*, [London], 141 (3575):835, May 7, **1938.** **DLC**—Observation of impressions believed to be from hail because deeper and wider than those for rain; author believes rain print localities should be re-examined. *Subject Headings:* **Hail, Natal, South Africa.**

D–13 551.578.7

Aujeszky, László, **A "tiszta jégesö" kérdése.** [The problem of "pure hail."] *Időjárás*, 42(14):233–242, Nov.–Dec. **1938.** equations. Summary in German p. 264–265. **DLC**—Definition of "pure hail" which is claimed to be more destructive than when found with other forms of precipitation. Gives evidence to prove that pure hail does exist. Damage from pure hail. *Subject Headings:* **Hail, Hail damage.**

D–14 551.578.7

Kolobkov, N. V., **Grozy i shkvaly.** [Thunderstorms and squalls.] Moscow, Gidromet. Izdat., **1939.** p. 58–67, 2 figs. **DLC-DWB**—First part deals with general information: accounts of hailstorms, problem of hail formation, appearance of hailstone. Second part deals with hail distribution in Russia. (Transl. by Alexander G. Alexeeff available at **DAMS.**) *Subject Headings:* **Hail, Hail distribution, U.S.S.R.**

D–15 551.578.7:551.515.4

*United Air Lines, **Thunderstorms. 1939.** 10 p., tables. Summary p. 9. **U. S., NACA**—Extent of hail season; hours of hail occurrence; hail-thunderstorm ratio; method of estimating large hail probability; principal rules for flying thunderstorms. *Subject Headings:* **Hail, Thunderstorms.**

D–16 551.578.7

Gassies, J. P., **La grêle.** [Hail.] Paris (O.N.M.), **1941,** 4°. dupl. p. 2+35. Abs. p. 34. (Unchecked.)—*Subject Heading:* **Hail.**

D–17 551.578.7

Groen, P., **Over hagel.** [On hail.] Hemel en Dampkring, 41:213–219, **1943.** (Unchecked.) **MH**—*Subject Heading:* **Hail.**

D–18 551.578.7

Bagot– – –, Beauvisage, L., Camo, R., **A propos des observations de grêlons.** *La Nature,* [Paris], 72: 144, **1944. DWB**—*Subject Heading:* **Hail.**

D–19 551.578.7:551.509.3

Morandi, Luis, **Actividades meteorológicas en el Uruguay; una investigación metódica de la recuencia e intensidad del granizo en el Uruguay.** [A methodical investigation of the frequency nd intensity of hail in Uruguay.] *Revista Meteorológica,* 3(11):297–298, July **1944. DWB**—Describes project to begin in Jan. 1945 whereby persons untrained in meteorology will take hail bservations throughout the country. *Subject Headings:* **Hail, Methods of observation, Uruguay.**

D–20 551.578.7

Lane, Frank Walker, **Hail.** (In his **The elements rage.** London, Country Life, Ltd., **1945.** . 49–58.) **DLC**—Article in popular style covering such topics as: formation of hailstones, record ize hailstones, severe hailstorms, loss of property and human life and mechanical methods of warding ff hailstorms. *Subject Heading:* **Hail.**

D–21 551.578.7

Lafon, Jean, **La grêle.** [Hail.] *Le Vrai Cognac,* New Series [No. 12]:137–138, April **1949. DA**—*Subject Heading:* **Hail.**

HAIL FORMATION THEORIES AND FORECASTING

D–22 551.578.71

Schwaab, W., **Die Hagel-Theorien; alterer und neuerer Zeit, deren Nachweis in der Literatur ebst theilweiser kritischer Beleuchtung.** [Hail theories; earlier and modern times, references to the terature as well as critical comments.] Cassel, Verlag der E. Hühn'schen Buchhandlung, **1878.** 5 p., refs. **DWB**—*Subject Heading:* **Hail formation.**

D–23 551.578.71

Cloud phenomena attending hailstorms. *Monthly Weather Review,* 22(7):292–293, July **1894.** Quoted from a lecture by Frank W. Very.) **DWB**—*Subject Heading:* **Hail formation.**

D–24 551.578.71

Schreiber, P., **Beiträge zur Hageltheorie.** [Contributions to hail theory.] *Meteorologische eitschrift,* 18(2):58–70, Feb. **1901.** 4 tables, 23 equations. **DLC**—An early theoretical paper on the ertical velocity necessary to support certain sizes of hailstones. *Subject Headings:* **Hail formation, [ail structure.**

D–25 551.578.71

Bigelow, Frank H., **Theories of the formation of hailstones.** (In his **Studies on the thermodynamics of the atmosphere.** *Monthly Weather Review,* 34(11):515–517, Nov. **1906.**) **DWB**—xplains following theories: oscillation theory, orbital theory, upward current theory, electrical traction theory, and stratification theory. *Subject Heading:* **Hail formation.**

D–26 551.578.71

Gibson, J. B., **The formation of hail.** *Monthly Weather Review,* 37(1):11, Jan. **1909. DWB**—ompares formation of hailstone with solidification of water in a glass. *Subject Heading:* **Hail rmation.**

D–27 551.578.71:551.515.4

Humphreys, William J., **The thunderstorm and its phenomena.** *Monthly Weather Review,* (6):348–380, June **1914. DWB**—Hail a phenomena that occurs during early part of most severe understorms. Describes formation of hailstone. *Subject Headings:* **Hail formation, Thunderorms.**

D–28 551.578.7

Hachey, H. B., **The rotation of melting ice suspended in benzine.** *Franklin Institute, Philadelphia, Journal,* 197(6):825–827, June **1924.** **DLC**—*Subject Heading:* **Hail formation.**

D–29 551.578.7

Blair, Thomas A., **Hailstones of great size at Potter, Nebr.** *Monthly Weather Review,* 56(8):31. Aug. **1928.** photo. **DLC**—Contains account of H. Stevens, cooperative observer of the U. S. Weather Bureau and affadavits signed by two responsible citizens. One hailstone measured 1 inches in circumference and weighed 1½ pounds. Largest single hailstone in the world for which there is an authentic record. Size of hailstone was too great to allow explanation that it was due to strength of upward convective current. Probable explanation is that stone grew rapidly while falling through a thick stratum of supercooled droplets. *Subject Headings:* **Hail formation, Hail structure, Nebraska.**

D–30 551.578.7

Humphreys, William J., **The up-rush of air necessary to sustain the hailstone.** *Monthly Weather Review,* 56(8):314, Aug. **1928.** **DLC**—Supports theory that updrafts of hurricane velocities are necessary for production of large hailstones. Table, based on wind tunnel experiments at U. S. Bureau of Standards, shows vertical velocities sufficient to just maintain hailstones of various diameters and densities. *Subject Headings:* **Hail formation, Vertical velocities.**

D–31 551.578.7

Brooks, C. E. P., **Formation of hail.** *Discovery* (London), 10(117):305–308, Sept. **1929.** 2 figs. **DLC**—Article written in popular style. Deals particularly with formation and growth of hailstones. *Subject Heading:* **Hail formation.**

D–32 551.578.71:551.515.

Shaw, William Napier, **Manual of meteorology.** Cambridge [England], University Press, **1930.** V. 3, p. 337–338. **DLC**—Relates three accounts of the fall of unusually large hailstones. Concludes that "there is certainly, in the case of thunderstorms of which heavy raindrops and hailstones are characteristic, the possibility of the force of the very powerful electric field being of the same order as the force of gravity, and being strong enough while it lasts to hold the weight of the condensed water as raindrops or hailstones in suspension in the atmosphere against the force of gravity." *Subject Headings:* **Hail formation, Thunderstorms.**

D–33 551.578.71:551.515.

Day, Gene, **Hailstones are weather wonderworks; a curious kind of push-ball contest occurs as hail is formed during a thunder-storm.** *Tycos, Rochester,* 22(4):131–132, 147, Oct. **1932.** 4 figs. **DLC**—*Subject Headings:* **Hail formation, Hail structure, Thunderstorms.**

D–34 551.578.7

Grimminger, George, **The upward speed of an air current necessary to sustain a hailstone.** *Monthly Weather Review,* 61(7):198–200, July **1933.** table, 7 refs., 7 equations. **DLC**—Gives method of computing upward air speed necessary to support hailstones, taking into consideration turbulence. *Subject Headings:* **Hail formation, Vertical velocities.**

D–35 551.578.7:551.509.

Stoye, Karl, **Sind Schwunderscheinungen der elektromagnetischen Wellen Vorzeichen einer drohenden Hagelgefahr?** [Is the fading of electro-magnetic waves an indication of a dangerous hailstorm?] *Meteorologische Zeitschrift,* 53(9):346–347, Sept. **1936.** **DWB**—*Subject Heading:* **Hail forecasting.**

D–36 551.578.7

Frey, H., **Zur Entstehung des Hagels.** [On the origin of hail.] *Beiträge zur Geophysik,* 50(2–4):216–222, **1937.** 3 figs., 19 refs. **DLC**—Explanation of the multiple-incursion theory of hail formation with description of necessary conditions. *Subject Heading:* **Hail formation.**

D–37 551.578.71:531.

Bilham, F. G. and Relf, E. F., **The dynamics of large hailstones.** *Royal Meteorological Society, Quarterly Journal,* 63(269):149–160, April **1937.** 4 figs., 5 tables, 6 equations. Discussion p. 160–162. **DLC**—Theoretical study dealing with terminal velocity of hailstones—object two-fold: (1) to determine magnitude of vertical air currents necessary in formation of hailstones, (2) to determine kinetic energy hailstones may possess on reaching the ground. Concludes that under normal circumstances there is sudden and very large increase in terminal velocity when the diameter of the

hailstone reaches a certain value. *Subject Headings:* **Hail formation, Hailstone size distribution, Vertical velocities.**

D–38 551.578.71:632.1

Ruby, F., **Nouvelles études sur la grêle.** [New studies on hail.] *Revue de Géographie Régionale*, [Lyon], 14(2–3):107–184, **1938.** 8 figs., 11 refs. **DWB**—First part of article deals with phenomena that contribute to hail formation, formation of different types of hail, cloud situation necessary for development of hail, and various methods of protection against hail. Latter part deals with the organization of defense in the Beaujolais region, with data for 1938. Concludes that the system worked satisfactorily. *Subject Headings:* **Hail formation, Hail damage protection, France.**

D–39 551.578.71:551.511

Schumann, T. E. W., **The theory of hail formation.** *Royal Meteorological Society, Quarterly Journal*, 64(273):3–21, Jan. **1938.** 2 figs., 3 tables, 6 refs., 25 equations. Summary p. 3. Discussion p. 17–21. **DLC**—Presents a careful mathematical analysis in proof of theory that large hailstones are formed by the capture of under-cooled water drops which lie in their path. Explains method of disposal of latent heat. *Subject Heading:* **Hail formation.**

D–40 551.574.1:551.578.71

Gabran, O., **Verfahren zur Abscheidung von Aerosolen aus Schnee und Hagel.** [Process for separation of aerosols from snow and hail.] *Meteorologische Zeitschrift*, 55(3):112–113, March **1938.** 2 refs. **DWB**—A technique for catching fresh snow or hail in a two liter jar containing pure petroleum at subfreezing temperature, allowing the impurities to be separated and examined microscopically or spectroscopically in order to determine the nature of the condensation nuclei. *Subject Headings:* **Condensation nuclei, Hail formation.**—*M.R.*

D–41 551.578.71

Vigeron, H., **L'état solide de l'eau.** [The solid state of water.] **La grêle.** [Hail.] *La Nature*, [Paris], 66(3039):360, Dec. 15, **1938.** **DLC**—In a short article on phenomena of hailstones, Schumann's theory for formation and growth is included and his explanation given for the occurrence of very large hailstones. *Subject Headings:* **Hail formation, Hail structure.**

D–42 551.578.71

Puig, I., **La formación del granizo.** [The formation of hail.] Buenos Aires, Publ. Cient. Obs. San Miguel, 14:139–150, **1939.** (Unchecked.)—*Subject Heading:* **Hail formation.**

D–43 551.578.71:551.594.2

Chalmers, J. A. and Little, E. W. R., **Electric charge on soft hail.** *Nature*, [London], 143(3615):244, Feb. 11, **1939.** **DLC**—Record of a larger precipitation current than had ever been observed before. *Subject Headings:* **Hail formation, Electricity of precipitation.**

D–44 551.578.71:551.515.4

Rossmann, F., **Blitz und Hagel (Über die elektrische Natur des Gewitters).** [Lightning and hail (On the electrical nature of thunderstorms.)] *Meteorologische Zeitschrift*, 56(10):372–378, Oct. **1939.** 2 figs., 17 refs. Abstract p. 372. **DWB**—Based on three years of observations at Feldberg (Schwarzwald) and on reports from flights through thunderstorms and rain-shower clouds, the author presents a schematic picture of the structure of the two types of cumulus clouds (water clouds and ice clouds), showing the zones where ice particles, snow, graupel, hail, melting snow and rain occur, and the electric field in the vicinity of the cloud. A theory on the relation of hail to lightning is presented, with numerous quotations from literature dating back to the 18th century. Hail and lightning are less frequent when the zero isotherm is high, than (as in August to May) when it is low, and also less frequent in the tropics than the temperate zone, and in mid-day than at night. *Subject Headings:* **Hail formation, Thunderstorms, Lightning, Germany.**—*M.R.*

D–45 551.578.71

Koch, A. A., **The dynamics of raindrops and hailstones.** U. S. War Department, Corps of Engineers, South Pacific and North Pacific Division, Engineering Conference, Proceedings, San Francisco, Feb. **1940.** p. 236–237, 241–268. (Unchecked.)—*Subject Heading:* **Hail formation.**

D–46 551.578.71:551.594.2

Everdingen, E. van, **Electrische verschijnselen bij sublimatie en verdamping van ijs en bij de vorming van lossen hagel.** [Electric phenomena connected with sublimation and evaporation of ice during formation of hail.] *Hemel en Dampkring*, 38:352–358, **1940.** **MH**—*Subject Headings:* **Hail formation, Electricity of disturbed weather.**

D–47 551.578.7

Rossmann, F., **Über die Bildung und Auflösung des Hagels.** [On the formation and release of hail.] *Annalen der Hydrographie und Maritimen Meteorologie*, 68(3):89–93, March **1940.** Discussion by W. Findeisen, *idem*, 68(8):281–282, Aug. **1940. DHO**—Dynamic and thermodynamic conditions necessary for and attending the formation of hail are considered. Especial attention is paid to the conditions of supercooling in the cloud tops, the thickness of cloud and the velocity fields necessary to form and support hailstones several inches in diameter. Examples are cited. *Subject Heading:* **Hail formation.**—*M.R.*

D–48 551.578.7

Brunt, David, **Weather study.** New York, Ronald Press, [1942]. p. 126–127. **DLC**—Brief simple step by step description of the formation of hailstones, with schematic diagram. *Subject Heading:* **Hail formation.**

D–49 551.578.7

Byers, Horace Robert, **General meteorology.** New York, McGraw Hill Book Co., **1944.** p. 578–581. fig., chart. **DLC**—Explains briefly the multiple incursion and long-fall theories of hail formation. Explanation for exploding hailstones. Photo shows sizes of hailstones in relation to teacup and baseball. Includes charts of average annual number of days with hail for the United States. *Subject Headings:* **Hail formation, Hail structure, Hail distribution.**

D–50 551.578.7

Berry, Frederick A., Bollay, E., and Beers, Norman R., **Handbook of meteorology.** New York, McGraw-Hill Book Co., **1945.** p. 257, 261–262, 359–361, and 712. equations. **DWB**—Brief references to hail formation, hail as a form of precipitation from cumulus type clouds. Equation for hail stage of saturated air. Data on hailstone size distribution. *Subject Headings:* **Hail formation, Hailstone size distribution.**

D–51 551.578.71:551.515.

Buell, C. E., **The occurrence of hail in thunderstorms.** *Journal of Aeronautical Meteorology*, 1(3):120–128, April **1945.** 17 figs., 2 tables, 7 refs. Abstract p. 120. **DLC**—Discusses hail formation theories; reviews measures of thunderstorm intensity; concludes that thunderstorms in the central United States during spring, fall and winter frequently produce hail. *Subject Headings:* **Hail formation, Thunderstorms, United States.**

D–52 551.578.7

Brooks, Charles F., **On the growth of hailstones.** *American Meteorological Society, Bulletin*, 27(6):358, June **1946. DLC**—Letter to editor refuting statement by Gerson, *idem*, 27(2):47–53, Feb. 1946, offers explanation for hailstone continuing to grow during first part of final fall to earth. *Subject Heading:* **Hail formation.**

D–53 551.578.7:551.509.

§Boutet, R., **De la prévision de la grêle.** [On the forecasting of hail.] *Revue pour l'Étude des Calamités*, [Geneva], 10(25):14–20, Jan.–Dec. **1947.** 3 figs. **DWB**—Author explains the application of a theory of Arctic or polar air invasions in the upper atmosphere to forecasting hail occurrence. *Subject Heading:* **Hail forecasting.**

D–54 551.578.71:551.509.

*Newman, B. W., **Phenomenal hailstorm with thunderstorm, Sydney, 1st January, 1947.** *Weather Development and Research Bulletin*, No. 8:23–38, July **1947.** 7 figs. (including synoptic charts and 3 adiabatic charts), 2 refs. Comment p. 39–41. **DWB**—Path of storm outlined, detailed description of meteorological changes with data, data from area where storm originated. List of primary predictions that would have been necessary for a more accurate forecast. *Subject Headings:* **Hail forecasting, Thunderstorms, New South Wales.**

D–55 551.578.7

Weickmann, Helmut, **Die Entstehung der Hagelkornstruktur.** [The formation of hail structure.] (In his **Elements of clouds and precipitation.** Fiat Final Report 1063, Office of Military Government for Germany (U.S.) Field Information Agency, Technical, June **1947.** p. 22.) **MH-BE**—*Subject Heading:* **Hail formation.**

D–56 551.574.7:551.578.7

Gaviola, Enrique and Alsina Fuertes, Fidel, **Hail formation, vertical currents, and icing of aircraft.** *Journal of Meteorology*, 4(4):116–120, Aug. **1947.** table, 11 refs., 3 equations. Abstract

p. 116. Comments by C. W. Newton, *idem*, 4(6):205–206, Dec. **1947.** **DWB**—Critical examination of theory that hail formation depends on strong ascending currents and the theory that it depends on tornadic action. Outlines a tentative description of the growth of large hailstones showing how various factors should contribute toward growth. No evidence that vertical currents exist whose speed could compare with falling hailstones. *Subject Headings:* **Hail formation, Icing of aircraft, Vertical velocities.**

D–57 551.578.71

Weickmann, Helmut, **Formation and fighting the hail.** Manuscript prepared in Germany in Aug. **1948.** Being translated into English. (Unchecked.)—*Subject Heading:* **Hail formation.**

D–58 551.578.71

†Horton, Robert E., **Convectional vortex rings—hail.** *American Geophysical Union, Transactions*, 30(1):29–45, Feb. **1949.** 9 figs., 4 tables, 21 refs., 22 equations. Abstract p. 29. (Posthumous publication, arranged by Richard Van Vliet.) **DWB, MH-BH**—Comprehensive treatment, with theoretical and practical aspects, of hailstorms that occur in conjunction with ring-vortex storms. Description of vortex-ring clouds from Mears, Creighton and others. Statements verified by experiment using smoke-box apparatus. Characteristics of hail; giving illustrations from Arenberg, Ellison, Russell and others. Among conclusions stated that hail formed in ring vortices is likely to be of maximum size, relatively uniform in size and internal structure. *Subject Heading:* **Hail formation, Vortex rings.**

D–59 551.578.71

†U. S. Air Weather Service. **Survey of hail studies.** [Washington], Feb. **1949.** [27] p., tables, 32 refs. **DAWS**—Report deals with: (1) Conditions which are known or appear to be present whenever hail occurs, (2) formation and growth of hail, and (3) data available as to size, frequency and distribution of hail. Reviews briefly most recent work done on theories of hail formation, vertical velocity of air in relation to falling hailstones, formation of hail of irregular shapes, and other problems facing meteorologists and forecasters. Enumerates difficulties in plotting frequency and distribution of hail. *Subject Headings:* **Hail formation, Hail structure, Hail forecasting, Vertical velocities.**

HAIL STRUCTURE

D–60 551.578.71

Oliver, J. A. Westwood, **Note on the formation of hail.** *Royal Meteorological Society, Quarterly Journal*, 7, new series, (40):247–249, Oct. **1881.** **DWB**—Lists 13 items on which observers should send him information, with notes on each item. *Subject Headings:* **Hail structure, Methods of observation.**

D–61 551.578.71

[Abbe, Cleveland], **The structure of hailstones.** *Monthly Weather Review*, 25(8):352–353, Aug. **1897.** **DWB**—Description of peculiar hailstones that fell at Hannover, Jan. 9, 1897. *Subject Headings:* **Hail structure, Germany.**

D–62 551.578.71

Webster, E. S., **Structure of hailstones.** *Monthly Weather Review*, 34(3):109, March **1906.** **DWB**—Size and shape of hailstones. No air bubbles observed when hailstones were placed in clear water or soapsuds. Cleveland Abbe gives three possible explanations for origin of snowy ice at center of hailstone. *Subject Heading:* **Hail structure.**

D–63 551.578.71

[Abbe, Cleveland], **Suggestions to observers of hailstones.** *Monthly Weather Review*, 34(6):278, June **1906.** **DWB**—*Subject Headings:* **Hail structure, Methods of observation.**

D–64 551.578.71

Smith, Wellington, **Structure of hailstones.** *Monthly Weather Review*, 34(6):277, June **1906.** **DWB**—All stones observed were dished, or hollowed, toward center; some had holes. Some gave off bubbles when placed in water. *Subject Headings:* **Hail structure, Pennsylvania.**

D–65 551.578.71

Bigelow, Frank H., **Building of hail.** (In his **Studies on the thermodynamics of the atmosphere.** *Monthly Weather Review*, 34(11):514–515, Nov. **1906.**) **DWB**—Detailed description of physical structure of hailstone; diameters, classes as to shape, order of construction from center outward. *Subject Heading:* **Hail structure.**

D–66 551.578.71

Landis, D. S., **The structure of hailstones.** *Royal Meteorological Society, Quarterly Journal* 33(141):63–65, Jan. **1907.** 3 figs. **DWB**—Symmetrical hailstones, prevailing form an oblate spheriod. Largest stones had nine definitely marked concentric layers surrounding a central nucleus; others had three, five and seven layers. Detailed descriptions of five, seven and nine layer types. Concludes that it is incorrect to say that the center of a hailstone is either crystal ice or amorphous ice. *Subject Headings:* **Hail structure, Texas.**

D–67 551.578.71

Cline, Joseph L., **Hailstorm at Corpus Christi, Texas.** *Monthly Weather Review*, 35(5):218–219, May **1907.** **DWB**—Description of hailstones. *Subject Headings:* **Hail structure, Texas.**

D–68 551.578.71

Von Herrmann, Charles F., **The severe hailstorm at Atlanta.** *Monthly Weather Review*, 37(10):710–711, Oct. **1909.** **DWB**—Storm of Oct. 14, 1909. Stones varied from ½ to 2½ or 3 in. in diameter. Street railway and telephone systems disorganized for a time. *Subject Headings:* **Hail structure, Georgia.**

D–69 551.578.71

[Sullivan, Richard H.], **Unusual hailstorm, Wichita, Kans.** *Monthly Weather Review*, 40(5):739, May **1912.** **DWB**—Sizes and composition of stones. *Subject Headings:* **Hail structure, Kansas.**

D–70 551.578.71

Lingle, J. D., **Unusual hailstone formation.** *Monthly Weather Review*, 40(6):968, June 1912. 3 figs. **DWB**—Drawings of hailstones of peculiar structure. *Subject Heading:* **Hail structure.**

D–71 551.578.71

Lloyd, F. E., **Structure of hailstones of exceptional form and size.** *Monthly Weather Review*, 45(8):412, Aug. **1917.** **DWB**—Stones had central core with icicle-like projections. *Subject Headings:* **Hail structure, California.**

D–72 551.578.71

Horton, Edgar C., **Hailstorm near Birmingham, Ala., May 11, 1921.** *Monthly Weather Review*, 49(6):334, June **1921.** **DWB**—Sizes of hailstones unusually large, details given. Damage. *Subject Headings:* **Hail structure, Alabama.**

D–73 551.578.71

Simes, E. F., **Hailstorm at Wausau, Wis., May 22, 1921.** *Monthly Weather Review*, 49(6):334–335, June **1921.** **DWB**—Description of stones: some over 5″ in diameter. Damage of $150,000. *Subject Headings:* **Hail structure, Hail damage, Wisconsin.**

D–74 551.578.71

Réthly, Anton, **Hailstones observed at Budapest July 13, 1922.** *Monthly Weather Review*, 52(4):206, April **1924.** fig. **DWB**—Descriptions and drawings of five hailstones carefully observed by the author. *Subject Headings:* **Hail structure, Hungary.**

D–75 551.578.71

Johnson, Harley N., **Severe hailstorm at Rapid City, S. Dak., and vicinity, July 18, 1924.** *Monthly Weather Review*, 52(7):349, July **1924.** **DWB**—Hail barrage lasted 36 minutes. Size of stones ranged from peas to small hen eggs. Damage was high in a small area. *Subject Headings:* **Hail structure, Hail damage, South Dakota.**

D–76 551.578.71

Spencer, James H., **Hailstorm of Sunday afternoon, May 24, 1925, at Baltimore, Md.** *Monthly Weather Review*, 53(6):261–262, June **1925.** **DWB**—Followed hottest weather ever recorded for May in Baltimore. Size and shape of stones. Damage chiefly to greenhouse glass. *Subject Headings:* **Hail structure, Hail damage, Maryland.**

D–77 551.578.71

Remarkable hailstorm in Iraq. *Meteorological Magazine*, [London], 65(774):143–144, July **1930.** **DLC**—Description of storm on April 24, 1930 at Hinaidi and Baghdad. Unusual features: large size of hailstones, slow terminal velocity of stones, absence of dust in their composition. Table showing five alternate layers of hard transparent ice and soft white ice with thickness given for an average specimen. Hailstones fell at slow rate of nine miles per hour and appeared perfectly clean. Illustration on frontispiece of magazine indicated size of stones. *Subject Headings:* **Hail structure, Iraq.**

D–78 551.578.71

Blair, Thomas A., **Muddy hailstones.** *American Meteorological Society, Bulletin,* 15(12):307–08, Dec. 1934. **DWB**—Hailstones fell after a period of 36 days when there had been only 0.08 inches of rain in this area. *Subject Headings:* **Hail structure, Nebraska.**

D–79 551.578.71

Pierce, Charles H., **Causes for colored hailstones.** *American Meteorological Society, Bulletin,* 15(12):308, Dec. **1934. DWB**—*Subject Heading:* **Hail structure.**

D–80 551.578.71

Botley, Cicely M., **Shapes of hailstones.** *Royal Meteorological Society, Quarterly Journal,* 63(271):337, July **1937. DLC**—Calls attention to illustrations of fantastic shapes of hailstones in Vissandier's "Ocean Aerien." *Subject Heading:* **Hail structure.**

D–81 551.578.71

Schmauss, A., **Ist Hagel kosmiches Eis?** [Is hail cosmic ice?] *Zeitschrift für die Gesamte Naturwissenschaft,* Brunswick, 3:233–238, **1937.** (Unchecked.) **DLC**—*Subject Heading:* **Hail structure.**

D–82 551.578.71

Johnson, R. P., **Structure of hailstones.** *Nature,* [London], 142(3586):172, July 23, **1938. DLC**—Hailstones which fell in Washington, D. C., April 29, 1938 appeared to be fragments of larger stones. Appeared to have been broken below region of formation. Two miles away complete hailstones fell. It was suggested that a pressure wave resulting from a bolt of lightning caused the shattering. *Subject Headings:* **Hail structure, Washington, D. C.**

D–83 551.578.71

Arenberg, David L., **The formation of irregularly shaped hailstones.** *Monthly Weather Review,* 66(9):275–276, Sept. **1938.** 6 equations. **DLC**—Advances evidence to prove that irregularly shaped hailstones are the result of the bursting of a much larger spherical stone. *Subject Heading:* **Hail structure.**

D–84 551.578.71

Ròdes, L., **Grêlons de dimension exceptionelle.** [Hailstones of exceptional dimension.] *La Météorologie,* 3e Série, p. 320–321, Sept.–Oct. **1938. DWB**—*Subject Heading:* **Hail structure.**

D–85 551.578.71

Little, E. W. R., **Observations on hail.** *Royal Meteorological Society, Quarterly Journal,* 66(283):21–22, Jan. **1940. DLC**—Brief account of two hailstorms on Oct. 27, 1939 in Durham where hail is a winter phenomenon. In both cases air temperature was slightly above freezing which may have been responsible for the formation of stones resembling bundles of fibres. *Subject Headings:* **Hail structure, England.**

D–86 551.578.71

Thone, F., **Falling frozen water.** *Science News Letter,* 39(2):31, Jan. 11, **1941.** fig. **DLC**—Brief description in popular style of various kinds of frozen water, including hail. *Subject Heading:* **Hail structure.**

D–87 551.578.71

Arenberg, David L., **The formation of small hail and snow pellets.** *American Meteorological Society, Bulletin,* 22(3):113–116, March **1941.** 8 figs., 11 refs. **DLC**—Describes in detail grains of graupel that fell on Mount Washington on May 1, 1939. With added note giving possible proof that hailstones can freeze from the surface inward. *Subject Headings:* **Hail structure, New Hampshire.**

D–88 551.578.71

Brooks, Charles F., **Hail shells.** *American Meteorological Society, Bulletin,* 24(2):53, Feb. **1943. DLC**—Description of hailstones that fell at Silver Lake, New Hampshire, June 28, 1940 which appeared to be "hastily frozen large wet snowflakes." *Subject Headings:* **Hail structure, New Hampshire.**

D–89 551.578.71

Brooks, C. E. P., **The frequency distribution of hailstone sizes.** *Royal Meteorological Society, Quarterly Journal,* 70(305):227–228, July **1944.** fig. **DLC**—Tabulation and diagram showing hail sizes that fell in India between 1833–1897. *Subject Headings:* **Hail structure, Hail size distribution, India.**

D–90 551.578.

Trendell, E. R., **Lenticular hail.** *Royal Meteorological Society, Quarterly Journal,* 70(305):19 July **1944.** **DWB**—Very brief description of hailstone of unusual size (1¼ in. by ¼ to ⅜ in.) whi fell in London on May 29, **1944.** *Subject Headings:* **Hail structure, England.**

D–91 551.578.

Megaw, T. M., **Large hailstones in the English Midlands.** *Royal Meteorological Socie Quarterly Journal,* 71(307–308):150–151, Jan.–April **1945.** **DWB**—Author's observation of ha stones; many 1½ in. in diameter. Stones were spherical, nucleus not always centered and side mo remote from nucleus was cauliflower like in texture. Central section showed series of ice laye alternately white and clear; outer part being mainly white. *Subject Headings:* **Hail structur England.**

D–92 551.578.

Poulter, R. M., **Conical hail.** *Royal Meteorological Society, Quarterly Journal,* 71(307–308):12 Jan.–April **1945.** plate. **DLC**—Very brief note giving diameter, shape and melting time of tw distinct types of soft hail. *Subject Heading:* **Hail structure.**

D–93 551.578.

Brooks, Charles F., **Minimum water content of hail deposits.** *American Meteorological Societ Bulletin,* 26(4):122, April **1945.** **DWB**—Very brief note giving water equivalent of layers of hail different thicknesses. *Subject Heading:* **Hail structure.**

D–94 551.578.

*†Gerson, N. C., **Variation in physical properties and in atmospheric concentration of hail.** *Amer can Meteorological Society, Bulletin,* 27(2):47–53, Feb. **1946.** fig., 12 refs. **DLC**—Contains tab showing most common range of sizes, measured on the ground; tables giving frequency distributio of hail sizes for India, central Europe and the United States; lists three most common shapes hailstones; temperature within hailstones, temperature of hailstones on the ground, and temperatur of hailstones at certain altitudes; wetness of hailstones; horizontal and vertical distribution of hai *Subject Headings:* **Hail structure, Hail temperature, Hail size distribution.**

D–95 551.578.7

Lonsdale, Kathleen and Owston, P. G., **X-ray examination of hail.** *Nature,* [London 157(3989):479, April 13, **1946.** **DLC**—Authors unable to complete examination because of accident interruption of refrigeration where hailstones were kept. Very brief. Frequently quoted. *Subje Heading:* **Hail structure.**

D–96 551.578.7

Boyle, P., **An unusual fall of hailstones.** *Weather,* 1(5):160, Sept. **1946.** **DLC**—Description three types of hailstones that fell in the area surrounding Shouldham Thorpe, Norfolk on July 2 1946. Average size between 2 and 2½ inches in diameter. Reported to have been "as big a tennis balls" when they first fell. *Subject Headings:* **Hail structure, England.**

D–97 551.578.7

Parrot, Aimé, **A propos de grêlons.** [Concerning hailstones.] *La Nature,* [Paris 75(3140):240, July 15, 1947. fig. **DLC**—Brief item notes hailstorm at Mauléon (Basses-Pyrénées) Figure shows sketched shapes of hailstones. *Subject Headings:* **Hail structure, France.**

D–98 551.578.7

Texas hailstone found larger than a baseball. *Science News Letter,* 54(8):115–116, Aug. 21 **1948.** photo. **DLC**—Largest hailstone measured 11 inches in circumference. Storm was on May **3, 1948.** *Subject Headings:* **Hail structure, Texas.**

D–99 551.578.7

Grinsted, W. A., **Unusual hailstones.** *Meteorological Magazine,* [London], 78(920):55, Feb **1949.** fig. **DLC**—Drawing of star-shaped hailstones. *Subject Heading:* **Hail structure.**

D–100 551.578.7

Thornton, W. G., **Hail storm at Lord Howe Island. Unusual hailstones.** *Weather Develop ment and Research Bulletin,* No. 13, p. 43–44, July **1949.** fig. **DWB**—Changing weather condition noted and unusual features of hailstones enumerated. *Subject Headings:* **Hail structure, Lord Howe Island, New South Wales.**

D–101 551.578.71(03)

U. S. Weather Bureau, **WBAN manual of surface observations.** 6th ed. Washington, U. S. Government Printing Office, **1949.** p. 2. (Circular N.) **DWB**—Official definitions of hail and small hail. *Subject Headings:* **Hail structure, Glossaries.**

HAILSTORMS—SINGLE CASES

D–102 551.578.7

Tessier, M. et al., **Mémoire sur l'orage du dimanche 13 juillet 1788. Rapport au second mémoire sur l'orage à grêle du dimanche 13 juillet 1788.** [Account of the storm of Sunday, July 13, 1788. Report on the second account of the hailstorm of Sunday, July 13, 1788.] [*Académie des Sciences, Histoire, Paris*, 1789; *Académie des Sciences, Mémoire*, 1790], p. 628–638, 263–308. plate. (Photostat.) **DWB**—*Subject Headings:* **Hailstorms, France.**

D–103 551.578.7

Redhouse, J. W., **Remarkable hailstorm.** *Royal Meteorological Society, Quarterly Journal*, 10(52):303, Oct. **1884.** (Extract of a passage from the Annals of the Resuli Dynasty of Yemen in South Arabia. Unique manuscript belonging to the Library of the India Office [No. 1311, folio 158 recto, lines 3–11].) **DWB**—Amazing hailstone which fell in A. D. 1295–1296; size of small mountain!!! *Subject Headings:* **Hailstorms, Arabia.**

D–104 551.578.7

Severe hailstorms at St. Louis, Mo. *Monthly Weather Review*, 30(10):487, Oct. **1902. DWB**—Remarkable for occurrence at night and size of stones. Largest stones size of hen's eggs. Lasted only seven minutes but most severe ever experienced in St. Louis. *Subject Headings:* **Hailstorms, Missouri.**

D–105 551.578.7

Alexander, W. H., **Hailstorms in Porto Rico.** *Monthly Weather Review*, 31(5):233–234, May **1903.** map. **DWB**—Track of hailstorm of April 12 shown on map. *Subject Headings:* **Hailstorms, Puerto Rico.**

D–106 551.578.7

Hailstorm in the Bahamas. *Monthly Weather Review*, 33(6):260, June **1905. DWB**—*Subject Headings:* **Hailstorms, Bahamas, West Indies.**

D–107 551.578.7

Jones, A. H. and Wheeler, D. W., **Phenomenal hailstones.** *Royal Meteorological Society, Quarterly Journal*, 37(160):361–363, Oct. **1911.** photo. **DWB**—Two accounts of storm at Gavarnie, in the Hautes-Pyrénées. Plaster cast of stone in comparison with penny is shown in photo. *Subject Headings:* **Hailstorms, France.**

D–108 551.578.7

Hail in the tropics. *Monthly Weather Review*, 40(6):969, June **1912.** (Extract from Canal Record of July 3, 1912.) **DWB**—*Subject Headings:* **Hailstorms, Tropics.**

D–109 551.578.7

Hailstorm that devastated the plain of Owari. Aichiken Meteorological Observatory, Nagoya, Japan. [**1912.**] pages unnumbered, photos, maps, charts. (In Japanese.) **DWB**—Photos show damage, shape and structure of stones. *Subject Headings:* **Hailstorms, Hail structure, Hail d mage, Japan.**

D–110 551.578.7

[From notes of Eubank, E. M.], **Unusual hailstorm at Ballinger, Tex.** *Monthly Weather Bureau*, 45(3):118, March **1917. DWB**—Hail fell on March 16, 1917. Did not disappear completely until 7 days later. *Subject Headings:* **Hailstorms, Texas.**

D–111 551.578.7

Hirshberg, Leonard K., **Hail squall of May 1, 1917, and accompanying weather, Baltimore, Md.** *Monthly Weather Review*, 45(5):236–237, May **1917. DWB**—*Subject Headings:* **Hailstorms, Maryland.**

D–112 551.578.7

Hauptmann, Moritz, **Hailstorm in 1860, Leipzig.** *Royal Meteorological Society, Quarterly Journal*, 44(186):97, April 1918. (Letter translated by Arthur Duke Coleridge.) **DWB**—*Subject Headings:* **Hailstorms, Germany.**

D–113 551.578.7

Carter, Harry G., **Severe hailstorm in Nebraska.** *Monthly Weather Review*, 49(1):22–24, Jan. 1921. fig. **DWB**—Figure shows area of severe storm of July 16, 1920. *Subject Headings:* **Hailstorms, Nebraska.**

D–114 551.578.7

Severe hail storm at Corpus Christi, Tex. *Monthly Weather Review*, 52(4):205, April 1924. **DWB**—*Subject Headings:* **Hailstorms, Texas.**

D–115 551.578.7

Larsen, Edwin T., **The flooding of a pasture by hail.** *Monthly Weather Review*, 53(6):261, June 1925. **DWB**—*Subject Headings:* **Hailstorms, Hail damage.**

D–116 551.578.7

Bartniccy, St. i L. and Klimowicz, W., **Burze i orkan w Polsce w dniu 26 Kwietnia 1926 r.** [Unexpected storms and gales in Poland on April 26, 1926.] Państwowy Instytut Meteorologiczny, Poland, 1926. 13 p., maps, table. Summary in French p. 12–13. **DWB**—Brief mention of hail that accompanied storm. Several zones of hail are traced and shown on map. *Subject Headings:* **Hailstorms, Hail distribution, Poland.**

D–117 551.578.7

Kendall, J. L., Barron, W. E., and Dyke, R. A., **Hail April 21, 1929, in Kentucky, Illinois and Louisiana.** *Monthly Weather Review*, 57(4):157–158, April 1929. **DWB**—Brief accounts for Louisville, Kentucky; lower Ohio Valley; northeast Louisiana. Each written by one of authors. *Subject Headings:* **Hailstorms, Kentucky, Illinois, Louisiana.**

D–118 551.578.7

Pirou, Antony, **Les orages à grêle en France.** [Hailstorms in France.] *La Météorologie*, Nos. 52–54 (new sér.):428–441, July–Sept. 1929. tables. **DWB**—*Subject Headings:* **Hailstorms, France.**

D–119 551.578.7

Carey, Fred, **Hailstorm of 1881 stands as a record.** *American Meteorological Society, Bulletin*, 10(11):204–205, Nov. 1929. **DLC**—Hailstorm combined with tornado and cloudburst. Stones the size of small heads of cabbage. Extensive damage to houses and farm buildings. Horses, cattle, hogs and chickens killed. Growing crops ruined and trees stripped of fruit and foliage. *Subject Headings:* **Hailstorms, Hail damage, Nebraska.**

D–120 551.578.7

Greening, G. K., **Hailstorms of July 6, 1932.** U. S. Weather Bureau, Climatological data, 1932, part 3, July, Iowa Section, p. 62–63. map. **DWB**—Quoted from original journals of Lewis and Clark expeditions for first record of hailstorm in the area. For storm of 1932 destruction is given. Mentions erosion. Offers suggestion for studying and charting the course of these storms. Describes cloud formation prior to storm. Map shows path of hailstorm. *Subject Headings:* **Hailstorms, Iowa.**

D–121 551.578.7

Rodewald, Martin, **Das Hagelunwetter in der Zone Hildesheim-Peine vom 18 Juli 1936. Wetterskizzen Nr. 11.** [Hailstorm in the Hildesheim-Peine zone on July 18, 1936. Weathersketch No. 11.] *Annalen der Hydrographie und Maritimen Meteorologie*, 64(10):447–448, Oct. 1936. chart. **DLC**—Synoptic conditions in connection with one of the worst hailstorms in the Hannover-Brunswick portion of Germany. *Subject Headings:* **Hailstorms, Germany.**

D–122 551.578.7:551.578.71

Pollard, A. E., **Large hailstones at Northampton.** *Meteorological Magazine*, [London], 71(841):15–16, Feb. 1936. photo. **DLC**—Storm occurred on Sept. 22, 1935. Description of hailstones. *Subject Headings:* **Hailstorms, Hail structure, England.**

D–123 551.578.7:551.577.61

Hookham, A. H., **Hailstorm at Eastbourne, July 7th, 1938.** *Meteorological Magazine*, [London], 73(871):179, Aug. 1938. **DLC**—*Subject Headings:* **Hailstorms, Hail damage, England.**

D–124 551.578.7

Neville, Norman E., **Hailstorm near Winchester, July 7, 1938.** *Meteorological Magazine*, [London], 73(871):179, Aug. **1938. DLC**—Unique because first storm in that area in a century. *Subject Headings:* **Hailstorms, England.**

D–125 551.578.7

Pinkhof, M., **Merkwaardige Windhoozen en hagelval bij Hondeloopen op 12 Aug. 1938.** [Remarkable tornadoes and hailfall near Hondeloopen on Aug. 12, 1938.] *Hemel en Dampkring* 36: 348–361, 1938. (Unchecked.) **DWB**—*Subject Headings:* **Hailstorms, Holland.**

D–126 551.578.7

Slocum, Giles, **Unusual fall of large hailstones at Washington, D. C.** *Monthly Weather Review*, 66(9):275, Sept. **1938.** 2 figs. **DLC**—*Subject Headings:* **Hailstorms, Washington, D. C.**

D–127 551.578.7

Canaday, G. L., **Hail and windstorm over south-eastern Louisiana, Feb. 26, 1939.** *Monthly Weather Review*, 67(10):365–366, Oct. **1939.** 4 figs. **DWB**—Path of storm, size and depth of hailstones, wind velocity and damage. *Subject Headings:* **Hailstorms, Louisiana.**

D–128 551.578.7:551.515.4

Hail storm in New Orleans—a rare phenomenon. *Tycos Rochester*, 29(2):58–59, **1939.** photos. **DWB**—Details of the most destructive hailstorm in several decades which was accompanied by lightning, thunder and high wind. Hail the size of chestnuts. Damage from wind and hail. Storm was result of a violent thunderstorm-type condition which covered a large area. *Subject Headings:* **Hailstorms, Hail damage, Thunderstorms, Louisiana.**

D–129 551.578.7:551.515.4

Rossmann, F., **Ein bemerkenswerter Hagelfall: Sehr grosse, vereinzelt fallende Hagelsteine.** [A remarkable hailfall: Very large, scattered hailstones.] *Meteorologische Zeitschrift*, 57(1):43–45, Jan. **1940.** 2 figs., 2 refs. **DWB**—An analytical account of a thunderstorm situation in Bavaria on May 27, 1931. Hailstones the size of small tomatoes fell in widely scattered spots. Some were irregular in shape. The largest ones fell with such force that they buried themselves in the ground, or penetrated roofs. The stones were formed of concentric layers and were dry. An adiabatic chart for that day made from a sounding at Friedrichshafen shows the tremendous amount of energy available for convective activity. *Subject Headings:* **Hailstorms, Thunderstorms, Bavaria, Germany.** —*M.R.*

D–130 551.578.71

Botley, Cicely M., **A hail storm in Cape Colony.** *Royal Meteorological Society, Quarterly Journal*, 68(297):301, Oct. **1942. DLC**—Very brief note of hailstorm in Umtata. Average size of hailstones was larger than hen's egg. *Subject Headings:* **Hailstorms, South Africa.**

D–131 551.578.7

Conover, John H., **"Baseball" hail from towering cumulonimbus.** *Weather*, 1(7):217, Nov. **1946.** 2 photos. **DLC**—Severe hailstorm of July 4, 1944 over south-eastern Massachusetts. One photo was evidently taken while cumulonimbus was dropping baseball-sized hailstones on Taunton, Mass. which was about 20 miles away. *Subject Headings:* **Hailstorms, Massachusetts.**

D–132 551.578.7

Lucas, Gabriel, **Observations de grêlons.** [Hailstone observations.] *La Nature*, [Paris], 74(3126):383, Dec. 15, **1946.** 2 figs. **DLC**—Unusual fall of hail in Brittany (where hail is not frequent) on May 27, 1931. Hailstones 35 mm. in diameter. Crops destroyed. *Subject Headings:* **Hailstorms, Hail damage, Brittany, France.**

D–133 551.578.7

Grêlons monstrueux. [Tremendous hailstones.] *La Nature*, [Paris], 75(3129):43, Feb. 1, **1947. DLC**—Very brief account of hailstorm in Sydney, Australia on Jan. 1, 1947 in which 210 persons were hospitalized and extensive property damages incurred. *Subject Headings:* **Hailstorms, Hail damage, New South Wales.**

D–134 551.578.7:551.524

†Knoche, Walter, **Observaciones de un enfriamiento súbito debido a una granizada fina.** [Observations of a sudden fall of temperature following a hailstorm.] *Revista Meteorológica* 6(22):128–130, April **1947.** table, refs. **DWB**—Data based on storm at Córdoba. Table gives for every hour

of the 24: dry and wet temperature; wind direction and velocity; cloud formation. Comments on meteoropathological significance of sudden cooling of temperature. *Subject Headings:* **Hailstorms, Argentina.**

D–135 551.578.7

§Milthorpe, W., **An account of the severe hailstorm at Charleville, Queensland on 23rd November, 1947.** *Weather Development and Research Bulletin*, No. 10:21–22, June 1948. 2 photos, chart. **DWB**—Covers synoptic situation, upper air conditions, formation of storm, area of storm and damage. *Subject Headings:* **Hailstorms, Queensland, Australia.**

D–136 551.578.7

§Dwyer, W. N. and McIntyre, D. G., **Hailstorm at Western Junction on 31st October, 1948.** *Weather Development and Research Bulletin*, No. 12:43–44, March 1949. figs., photos. Comments p. 69. **DWB**—Synoptic situation preceding storm described. Subsequent weather changes noted: change in wind, lightning and thunder, heavy fall of hail, rain, drop in temperature. Emphasized effect of topography. *Subject Headings:* **Hailstorms, Australia.**

D–137 551.578.7

Hariharan, P. S., **Sizes of hailstones.** *Indian Journal of Meteorology and Geophysics*, Delhi, 1(1):73, Jan. 1950. **DWB**—Account of hailstorms in the Hyderabad State of India on March 17 and 18, 1939. The largest hailstones that fell on the first day weighed 7½ pounds, the largest on the second day weighed five pounds. The storm of March 17 affected 17 villages in an area of 30 square miles. Considerable damage. *Subject Headings:* **Hailstorms, Hail structure, India.**

HAIL DISTRIBUTION AND FREQUENCY

D–138 551.578.72:551.515.3(54)

Hill, S. A., **The tornadoes and hailstorms of April and May, 1888; in the Doab and Rohilkhand.** Calcutta, Baptist Mission Press, 1889. p. 135–180. plates, tables, 2 append. (Reprinted from the Journal of the Asiatic Society of Bengal, v. LVIII, Part II, No. 2, 1889.) **DWB**—General weather of the period. Number, times of occurrence, duration and paths of the tornadoes of the 30th of April and 1st of May. Direction and force of the wind in these storms. Electrical phenomena. Hail. Destruction of life and property. Relations of tornadoes to other meteorological phenomena. Plates give pressure at different altitudes, times and dates. "At every place without exception, from which anything like a full account of the local storm has been received, hail is reported." Twenty-eight persons killed, chiefly by hail. Little reliance can be put in estimates of other damage. *Subject Headings:* **Hail distribution, Hail damage, Tornadoes, India.**

D–139 551.578.72

Very, Frank W., **The hailstorm of May 20, 1892.** *American Meteorological Journal*, 10(6):263–273, Oct. 1893. 5 figs. **DLC**—Describes storm of uncommon violence affecting southeastern Ohio, southwestern Pennsylvania and the northern part of West Virginia. Eye witness accounts from a chemist, engineer, college professor, forecast official, etc. Drawings of cross sections and description of two hailstones picked up by author. Map showing advancing edge of cloud belt. Two photographs showing evidence of destruction. *Subject Headings:* **Hail distribution, Ohio, Pennsylvania, West Virginia.**

D–140 551.578.72(54)

*Eliot, J., **Hailstorms in India during the period 1883–97 with a discussion of their distribution.** *Indian Meteorological Memoirs*, 6(4):237–315, 1899. 4 maps, numerous tables. **DWB**—Tables give date, area affected, hour of occurrence, duration, direction from which storm came, size or weight of largest stones, character of storm and damage for various provinces of India. Information collected by revenue officer who reports damage so insurance can be paid. Colors on map indicate severity of storm. *Subject Headings:* **Hail distribution, Hail damage, India.**

D–141 551.578.72:551.515.4(44)

Angot, Charles, **Le tonnerre et la grêle dans la région de Paris.** [Thunder and hail in the Paris region.] Académie d'Agriculture de France, Comptes Rendus, Paris, 2(31):912–913, Oct. 11, 1916. **DLC**—Includes table showing thunderstorms and hailstorms by month for a 40 year period. Concludes that hailstorms are independent of thunderstorms. *Subject Headings:* **Hail distribution, Thunderstorms, France.**

D–142 551.578.72(73)

*Henry, Alfred J., **Hail in the United States.** *Monthly Weather Review*, 45(3):94–99, March 1917. tables. **DWB**—Geographic distribution; seasonal distribution; damage to crops by hail; distribution of hail in general (Württemberg and India); theories of hail formation. Tables give average number of days with hail, 1906–1915, for various regions of the United States. *Subject Headings:* **Hail distribution, Hail damage, Hail formation, United States.**

D–143 551.578.72(757)

Sullivan, Richard H., **Hailstorms in South Carolina, June 8 and 9, 1919.** *Monthly Weather Review*, 47(6):393, June 1919. fig. **DWB**—Location and extent of storms shown on map. *Subject Headings:* **Hail distribution, South Carolina.**

D–144 551.578.72(761)

Smythe, P. H., **Hailstorm in Alabama, Nov. 14, 1921.** *Monthly Weather Review*, 49(12):659–660, Dec. 1921. map. **DWB**—Map of a portion of Alabama showing occurrence of hailstorms with different shading for light hail, moderate hail and heavy hail. *Subject Headings:* **Hail distribution, Alabama.**

D–145 551.578.72(94)(961.5)(969)

Visher, Stephen S., **Hail in the tropics.** *American Meteorological Society, Bulletin*, 3(7–8):117–118, July–Aug. 1922. **DLC**—Cites records of hail storms in the tropics: northern territory of Australia; Queensland, Australia; Fiji Islands; Hawaiian Islands. *Subject Headings:* **Hail distribution, Australia, Fiji Islands, Hawaiian Islands.**

D–146 551.578.72(763)

Dyke, R. A., **Heavy hailstorm and local squall at New Orleans, La., with a summary of the previous records of hail.** *Monthly Weather Review*, 52(4):205, April 1924. *Subject Headings:* **Hail distribution, Louisiana.**

D–147 551.578.72(774)

Seeley, D. A. and Dole, R. B., **Hailstorms in Michigan.** *Monthly Weather Review*, 52(4):195–205, April 1924. 8 figs. (Maps of Michigan showing hailstorms for April, May, June, July, Aug., Sept., and Oct.; and for the period from April through Oct. for 1920–1923 inclusive.) **DWB**—Day by day record of storms in Michigan for 1920–1923 inclusive. Estimate of damage frequently given. *Subject Headings:* **Hail distribution, Hail damage, Michigan.**

D–148 551.578.72(82)

*Hoxmark, Guillermo, **Granizo en la República Argentina.** [Hail in the Argentine Republic.] Buenos Aires, Talares Gráficos del Ministerio de Agricultura de la Nación, 1927. 35 p., 29 figs., 4 tables, ref. At head of title: Ministerio de Agricultura de la Nación, Dirección de Meteorología. **DWB**—Article deals with hail formation, hail classification, protection against hailstorms, hail frequency and destructive hailstorms in 1926. Tables, chart and graphs show average monthly and annual hailstorm frequency for 17 stations (shown on location chart). Data collected for periods varying from 11 to 20 years. Other charts show average annual and monthly frequency for 1926. *Subject Headings:* **Hail distribution, Argentina.**

D–149 551.578.72(73)

Flora, Snowden D., **The widespread menace of hail.** *Monthly Weather Review*, 56(1):17, Jan. 1928. **DWB**—Brief summary of hail occurrence and damage for 1927. *Subject Headings:* **Hail distribution, Hail damage, United States.**

D–150 551.578.72(914)

Selga, Miguel, **Hail in the Philippines.** Manila, Bureau of Printing, 1929. 20 p., illus. At head of title: The Government of the Philippine Islands. Weather Bureau. Manila Central Observatory. **DWB**—Study of various cases of hailstorms based on old documents and recent weather reports. Twenty-three observations of hailstorms in high altitudes dating from time of Spanish governors to 1927. Thirty-seven observations of hailstorms in low altitudes covering period from 1656–1928. Thunderstorms 100 times more frequent than hail. Slight crop damage. *Subject Headings:* **Hail distribution, Philippines.**

D–151 551.578.72(73)

*U. S. Weather Bureau, **Bulletin W, Climatic summary of the United States (from the establishment of stations to 1930, inclusive).** Printed at the several section centers, and sold at U. S. Government Printing Office, Washington, D. C. Price $5 for 106 sections complete, unbound, 10 cents

per section. **DA, DWB**—Average number of days with hail is shown in tables of miscellaneous items. Latest compilation of all data from first order and cooperative Weather Bureau stations. *Subject Headings:* **Hail distribution, Hail statistics, United States.**

D–152 551.578.72(73)

Flora, Snowden D., **Hailstorms numerous in 1930.** *Rough Notes, the Business Magazine of Insurance*, 74(3):13, 14, 50, 51, March **1931.** photo. **DWB**—Occurrence and damage in various states, description of most destructive storm. Photo shows size of stones in comparison with teacup. *Subject Headings:* **Hail distribution, Hail damage, United States.**

D–153 551.578.72(497.2)

Kozaroff, P., **Des chutes de grêle désastreuses en Bulgarie durant les dix derniès années.** [Disastrous hailstorms in Bulgaria during the past ten years.] *Matériaux pour l'Étude des Calamités*, [Geneva], 32(4):349–352, **1933.** table. **DWB**—Hail usually occurs from middle of April to end of September with the most disastrous storms coming in June and July. Four worst storms in 10 year period took place in 1923, 1926, 1929 and 1932. These are described. *Subject Headings:* **Hail distribution, Hail damage, Bulgaria.**

D–154 551.578.72(477)(47)

*Gumiński, R., **Grady w wojewodztwie Tarnopolskiem (w okresie od r. 1926 do r. 1933).** [Track of hailstorms in the Tarnopol region (in the period from 1926 to 1933).] Państwowego Instytutu Meteorologicznego, Prace, 4:3–13, **1934.** 2 figs., 3 tables, refs. Title, headings in tables and summary (p. 12–13) in German. **DWB**—Advances opinion that hail occurrences are in correlation with the structure of the earth's crust. *Subject Headings:* **Hail distribution, Ukraine, U.S.S.R.**

D–155 551.578.72(45)

*Paoloni, P. D. Bernardo M., **Circa una prossima pubblicazione sulla distribuzione e sui danni della grandine in Italia.** [About a recent publication on hail distribution and damage in Italy.] *Meteorologia Practica*, 16(5–6):244–252, Sept.-Dec. **1935. DWB**—Table of frequency of hail disasters in 4,000 communities for years 1925–1935 arranged by provinces. For each province you can determine number and average of hailstorms for each 10 year period. Number of disasters in a large number of communities, monthly frequency of disasters, date of most disastrous storm and insurance odds are given. Damage to grain, rice, tobacco, fruits, noted. *Subject Headings:* **Hail distribution, Hail damage, Italy.**—*M.R.*

D–156 551.578.72(431.4)(43)

*Kunze, Gerhard, **Die räumliche Verteilung der Hagelwetter in Schlesien.** [The areal distribution of hailstorms in Silesia.] *Meteorologische Zeitschrift*, 53(3):102–105, March **1936.** 6 figs., 2 refs. Abstract p. 102. **DWB**—Hail damage frequency in each of the years, 1930 to 1934, and for the five year mean, is shown by means of isolines on charts of Silesia. The maximum frequency in any year was 12 days (1931 and 1934) near Breslau in Middle-Silesia. The author claims that analysis of the data shows no relation between orography, temperature, wind direction, or air masses and hail frequency; and a slight correlation between air pressure, wind speed or short-wave reception, and hail damage. Results agree with those found in a similar study for East Prussia. Methods of analysis not too sound. *Subject Headings:* **Hail distribution, Silesia, Poland.**—*M.R.*

D–157 551.578.72:621.396.8(43)

Kunze, Gerhard, **Sind Hagelschläge luftelektrisch bedingt?** [Do hailstorms depend on atmospheric electricity?] *Meteorologische Zeitschrift*, 53(1):32–33, Jan. **1936.** 2 figs., 4 refs. Abstract p. 32. **DWB**—Correlation found between days of good short wave radio (10 m) transmission and days without hail, and vice-versa. Also a 5½ day cycle was supposed to occur in both phenomena, although the graphic evidence presented is unconvincing. The conclusion is that good radio reception occurs when subsiding air masses prevail—a condition unfavorable for hail occurrence, and that poor reception occurs where air masses with convective activity prevail. **Rhythmische Wiederkehr von Hagelschlägen am gleichen Ort.** [Rhythmical recurrence of hail at the same place.] *Idem*, 53(5):191–192, May **1936.** fig., 5 refs. Abstract p. 191. **DWB**—Analysis of hailstorms for north Germany for 1932, 1934 and 1935 to prove that there is a 5½ day cycle in hail occurrence in a given region. Also correlation between hail occurrence and poor radio reception. Periodicity may be found mathematically significant, but since there is so much variation in length of periods, and so many periods skipped, such data would have little or no forecast value. *Subject Headings:* **Hail distribution, Radio transmission, Periodicities, Germany.**—*M.R.*

D–158 551.578.72:621.396.8

Stoye, Karl, **Hagel und 10m-Hörbarkeit.** [Hail and 10 m (radio) reception.] *Meteorologische Zeitschrift*, 53(9):346, Sept. **1936.** **DWB**—A severe criticism of conclusions presented by G. Kunze (see D-157), showing that many hailstorms occurred at times of maximum short-wave reception—in fact the worst hailstorm came on a day of maximum reception. Furthermore, the fact that several of the reception maxima came on Saturday night or Sunday when amateurs operate most often, reduces the reliability of the supposed 5½ day rhythm. The author states that short-wave radio reception is a function of ionospheric, not tropospheric conditions. Kunze, Gerhard, **Hagelhäufigkeit und Kurzwellenausbreitung.** [Hail frequency and short wave propagation.] *Meteorologische Zeitschrift*, 54(1):27–28, Jan. **1937.** **DWB**—A rebuttal to the article by Stoye, defending the author's previous article about the 5½ day periodicity in occurrence of hail and short-wave reception. **Einige Bemerkungen zur Fadingfrage.** [Some observations on the problem of "fading."] *Annalen der Hygrographie und maritimen Meteorologie*, 65(4):187–189, April **1937.** **DLC**—*Subject Headings:* **Hail distribution, Radio transmission, Periodicities.**—*M.R.*

D–159 551.578.72(497.1)

Reya, Oskar, **O toči v Dravski banovini v 1. 1936.** [On hailstorms in northwest Jugoslavia in 1936.] *Geografski Vestnik*, [Ljubljana], 12(13):101–114, **1936–1937.** 5 charts, table. Summary in German p. 112–114. **DWB**—Observations at 284 stations show 326 hailstorms for 1936. Five occurrences are analyzed thoroughly and isochronal charts presented for each case. *Subject Headings:* **Hail distribution, Hailstorms, Yugoslavia.**

D–160 551.578.72(73)

Ward, Robert DeCourcy and Brooks, Charles F., **The climates of North America I.** Handbuch der Klimatologie, Bd. II, Teil-J. Berlin, Verlag von Gebrüder Borntraeger, **1936.** p. 172, 253, table. **DWB**—Brief summary of data on hailstorm frequency, distribution and damage. Table lists monthly and annual days of hail for 195 places. *Subject Headings:* **Hail distribution, United States.**

D–161 551.578.72(661)

Some studies of the occurrence of hail. *Geographical Review*, 27(1):151–152, Jan. **1937.** On occurrence of hailstorms in French West Africa from 1921–1934 inclusive. (La grêle in A. O. F., Annales de Physique du Globe de la France d'Outremer, vol. 3, 1936, pp. 70–73.) **DLC**—*Subject Headings:* **Hail distribution, French West Africa.**

D–162 551.578.72(44)

Baillaud, René, **Foudre et grêle dans le département du Doubs régions privilégiées.** [Lightning and hail in the favored region of the department of Doubs.] *La Météorologie*, 3e:16–21, Jan.–Feb. **1937.** 3 figs. **DWB**—Coincidence in the occurrence of lightning strikes and hail in the same immediate vicinities of the Doubs region. *Subject Headings:* **Hail distribution, France.**

D–163 551.578.72

Knoch, K., **Hagelverbreitung und Hagelschäden in Deutschland.** [Hail distribution and hail damage in Germany.] O.M.I. Publ., No. 36, Kom. Landw. Met., Salzburg, p. 69–70, **1937.** (Unchecked.)—*Subject Headings:* **Hail distribution, Hail damage, Germany.**

D–164 551.578.72(45)

Notiziario meteorologico. Grandine, fulmini ed altri fenomini meteorologici importanti verificatisi in Italia nel secondo semestre 1937. [Meteorological Notes. Hail, lightning and other meteorological phenomena recorded in Italy in the second half of 1937.] *Meteorologia Practica*, 19(1):32–36, Jan.–Feb. **1938.** **DWB**—Brief notices of hailstorms throughout the country taken from newspapers. *Subject Headings:* **Hail distribution, Italy.**

D–165 551.578.72(54)

Ramdas, L. A., Satakopan, V., and Gopal Rao, S., **Frequency of days with hail storms in India.** *Indian Journal of Agricultural Science*, New Delhi, 8:787–805, **1938.** (Unchecked.)—*Subject Headings:* **Hail distribution, India.**

D–166 551.578.72:551.594.22(44)

Dauzère, Camille and Bouget, Joseph, **Sur la répartition des coups de foudre et des chutes de grêle dans le département des Hautes-Pyrénées.** [On the distribution of strokes of lightning and falls of hail in the department of Hautes-Pyrenees.] *Académie des Sciences, Paris, Comptes Rendus*, 208(23):1833–1835, June 5, **1939.** refs. (Read at meeting on May 22, 1939.) **DLC**—Author attempts to show connection between geologic structure, constitution of the soil and occurrence of lightning and hail. *Subject Headings:* **Hail distribution, Lightning, Pyrenees, France.**

D–167 551.578.72:551.594.22(44)

Dauzère, Camille, **Sur la répartition géographique de la foudre et de la grêle dans le département de l'Ariège.** [On the geographic distribution of lightning and hail in the department of Ariège.] *Académie des Sciences, Paris, Comptes Rendus*, 209:896–897, Dec. 11, **1939.** refs. (Read at meeting on Dec. 4, 1939.) **DLC**—An attempt to show a relation between geologic structure and soil types in Ariège and occurrence of lightning and hail. *Subject Headings:* **Hail distribution, Lightning, France.**

D–168 551.578.72(73)

U. S. Dept. of Agriculture, **Climate and man.** *Yearbook of Agriculture* 1941. Washington, D. C., U. S. Government Printing Office, **1941.** p. 730. **DWB**—Map showing annual number of days with hail, based on 200 first-order Weather Bureau stations, period 1899–1938. *Subject Headings:* **Hail distribution, United States.**

D–169 551.578.72(7)

*Lemons, Hoyt, **Hail in high and low latitudes.** *American Meteorological Society, Bulletin*, 23(2):61–68, Feb. **1942.** table, refs. **DWB, DLC**—Cites a number of widely scattered instances (in low and high latitudes) in which hail fell, with conclusions for each one. *Subject Headings:* **Hail distribution, United States, Canada, Alaska.**

D–170 551.578.72(73)

*Lemons, Hoyt, **Hail as a factor in the regional climatology of the United States.** *Geographical Review*, 32(3):471–475, July **1942.** 17 figs. **DLC**—Maps show general patterns of hailstorm distribution and occurrence. Areas of widest hail incidence are most extensively cultivated. *Subject Headings:* **Hail distribution, United States.**

D–171 551.578.72:551.588.7(43)

Weinlander, A., **Grosstadt und Klima.** [A big city and climate.] *Das Wetter*, 59:390–393, **1942.** (Unchecked.) **DWB**—*Subject Headings:* **Hail distribution, Germany.**

D–172 551.578.72(73)

*Lemons, Hoyt, **Semi-monthly distribution of hail in the United States.** *Monthly Weather Review*, 71(7):115–122, July **1943.** 27 figs. **DLC**—Twenty-four semimonthly maps show hail distribution and frequency in the United States. Greater accuracy in East and Midwest due to concentration of stations. Different patterns are found in interior, Eastern region and Pacific area. Most hail damage done in late afternoon; width of track of damaging hailstorms is from one to two miles. *Subject Headings:* **Hail distribution, United States.**

D–173 551.578.72:629.13

U. S. Navy Dept., Bureau of Aeronautics. **Hail.** Washington, **1943.** 7 p., 7 figs. (Technical Note No. 52–43.) (Manuscript form.) **U.S., NACA**—Contains definition of hail, theory of hail formation, frequency of occurrence in relation to thunderstorms, difficulties in forecasting, dangers of hail in flight, precautions to pilot and aerological meteorologist. Photos of hail size and damage to planes. Maps give average number of days with thunderstorms and hail for the period from 1899 through 1938. *Subject Headings:* **Hail distribution, Aeronautical meteorology.**

D–174 551.578.72:551.515.4(73)

Shands, A. L., **The hail-thunderstorm ratio.** *Monthly Weather Review*, 72(3):71–73, March **1944. DLC**—Article is section of the report on "Thunderstorm Rainfall" (see D–184). Concludes that climatic summaries indicate that in any region hail usually occurred on more than 20% of the days on which there were thunderstorms. The 25 year period from 1915 to 1940 was used to determine how many days there were thunderstorms in the state of Iowa and in the Maryland-Delaware-District of Columbia area. *Subject Headings:* **Hail distribution, Thunderstorms, United States.**

D–175 551.578.72

Montevideo. Estudios Superiores, Sección de Investigaciones Meteorológicas, **Observación de la frecuencia e intensidad del granizo en todo el territorio de la República.** [Observation of the frequency and intensity of hail in the entire Republic.] *Boletin de Meteorología*, 2(2):9–10, **1944. DLC**—*Subject Headings:* **Hail distribution, Uruguay.**

D–176 551.578.72(899)

*Morandi, Luis, **El granizo en nuestro clima.** [Hail in our climate.] *Revista Meteorológica*, 4(13):60–62, Jan. **1945.** tables. **DWB**—Statistics based on eight years observations of hail in the

ado [Montevideo] and 31 years in Villa Colón. Table gives average annual frequency of hail for departments of Uruguay. Details of hail size. *Subject Headings:* **Hail distribution, Hail structure, Uruguay.**

D–177 551.578.72(899)

*Bergeiro, José M., **Frecuencia e intensidad del granizo en el Uruguay.** [Frequency and tensity of hail in Uruguay.] *Revista Meteorológica*, 4(16):276–286, Oct. **1945.** 5 charts, table. **WB**—A study covering the decade from 1934 through 1943. *Subject Headings:* **Hail distribution, ail size distribution, Uruguay.**

D–178 551.578.72(494)

***Liste des chutes de grêle en Suisse pendant l'année 1945.** [List of hailstorms in Switzerland ring the year 1945.] *Switzerland. Meteorologische Zentralanstalt, Annalen*, V. 82, Suppl. No. 2, **45.** 1 p. **DWB**—Tables give daily and monthly (April–Sept.) frequencies for 22 cantons. The me type of information may be found in preceding volumes. *Subject Headings:* **Hail distribution, vitzerland.**

D–179 551.578.72(44)

Ruby, F., **La grêle dans le département du Rhone.** [Hail in the department of the Rhone.] n **Le climat de Lyon et de la région Lyonnaise,** M. Pierty, ed. Lyon, Editions Cartier, [**1946**]. 136–139.) **DWB, MH-BH**—Table shows total number of hailstorms by months for 25 years. *bject Headings:* **Hail distribution, France.**

D–180 551.578.72:551.515.4(46)

*Spain. Servicio Meteorológico Nacional, **Las tormentas en España durante el año agrícola 45–1946.** [Thunderstorms in Spain during the agricultural year 1945–1946.] (In its *Calendario eteoro-Fenológico 1947*. Madrid, Sección de Climatología, [**1946**?], p. 77–89. fig., tables.) **DA**— *bject Headings:* **Hail distribution, Thunderstorms, Spain.**

D–181 551.578.72(44)

Depeyre, G.-P., **Statistique des orages à grêle ayant atteint la Station du Sol. Commune de ontfermier (Tarn-et-Garonne) de 1901 a 1946.** [Statistics on hailstorms which reached the tation du Sol," municipality of Montfermie (Tarn-et-Garonne) from 1901 to 1946.] *La Météorgie*, 4e série, [5]:56–57, Jan.–March **1947. DWB**—A brief statistical record of all storms with il recorded in this vicinity in that period. *Subject Headings:* **Hail distribution, France.**

D–182 551.578.42:551.578.72(62)

Sutton, L. J., **Snow and hail in Egypt.** *Weather* 2(7):218–221, July **1947.** map. **DWB**—oted briefly instances of hail in Egypt in 1907, 1923, 1932 and 1937. Severe hailstorms usually curred during thunderstorms in October or November. *Subject Headings:* **Hail distribution, ypt.**

D–183 551.578.72(439.1)

†*Aujeszky, László, **Jégeső gyakoriság és valószínűseg Budapesten, 1871–1945.** [Hail frequency d hail probability in Budapest, 1871–1945.] Hungary. Országos Meteorológiai és Földmágnesgi Intézet. Budapest, **1947.** 28 p., 13 tables, 15 refs. Summary in English p. 26. (Miscellaneous pers. New series, No. 19.) **DWB**—Hailstorms are discussed from different points of view for e 105 years 1781–1792, 1841–1848 and 1861–1945. Tables give values of yearly trend of hail currences and hail frequency for decades during the period from April through August. *Subject adings:* **Hail distribution, Budapest, Hungary.**

D–184 551.578.72(73)

†*U. S. Weather Bureau, **Thunderstorm rainfall.** Vicksburg, Mississippi, Waterways Experiment tion, **1947.** Part I, p. 144–166. 4 tables, refs. (p. 312–315), Part II, figs. 69–77 (bound separely). At head of title: Hydrometeorological Report No. 5. **DWB**—Table shows hail-day data m the 40 years of record, 1904–1943 and gives a detailed comparison of the thunderstorm and hail tribution patterns. *Subject Headings:* **Hail distribution, Thunderstorms, United States.**

D–185 551.578.72(41)

*Champion, Donald L., **The seasonal distribution of hail in Great Britain.** *Weather*, 3(7):201–, July **1948.** 4 figs., plate, table. **DWB**—Analysis and compilation of records made throughout tain for 10 years (1937–1946) indicate greater frequency of hail at coastal stations than in interior, hough greater incidence of thunderstorms in interior places. Varies from 22 days per year at

Aberdeen, Scotland to 1.2 days at Cantref, Wales, with maximum in winter and minimum in summe inverse relation to thunderstorms with maximum in summer and minimum in mid-winter. List 13 phenomenal falls of hail; in one case covered ground 3 to 4 inches deep (Newquay, Feb. 10, 194 Conclusion is that hail is a convergence phenomena along coast line, whereas thunderstorms are mo often of convective origin. Three types of hail distinguished and defined. *Subject Heading* **Hail distribution, Great Britain.**—*M.R.*

D–186 551.578.72(49

*Philippson, Alfred, **Das Klima Griechenlands.** [The climate of Greece.] Bonn, Fer Dümmlers, **1948.** p. 120–121. table. **MH-BH**—Reference is made to annual hail frequency da for 26 stations, and monthly frequency for ten stations. Range is very great; seven days a year Crete to one day a year or less at Lamia. The monthly maximum in the interior and mountai is usually in spring, varying from March through June, and in winter on the west coast. *Subje Headings:* **Hail distribution, Greece.**—*M.R.*

D–187 551.578.72(43

*Poland. Państwowy Instytut Hydrologiczno-Meteorologiczny, **Grady w Polsce, 1947.** [Ha in Poland, 1947.] Prace, Zeszyt 3. [Reports, part 3.] Warsaw, **1948.** 110 p. 4 tables, 6 ma Summary in French p. 6–8. **DWB**—Shows concerted effort to make hail report. Extensive tabulated observations of hail taken throughout Poland in 1947. More statistical than meteor logical. *Subject Headings:* **Hail distribution, Hail damage, Poland.**

D–188 551.578.72:551.515.4(759)(77

*U. S. Weather Bureau, **A report on thunderstorm conditions affecting flight operation.** Was ington, [U. S. Government Printing Office], **1948.** p. 21–23, 2 tables. (Weather Bureau Technic Paper No. 7.) **DWB**—Few instances of hail in Florida or Ohio thunderstorms. Hail seldom fou at more than one or two levels in the same storm. Project carried out in regions considerab removed from area of maximum occurrence of hail at the surface. Tables show frequency a percentage distribution of various hail intensities at a given altitude. *Subject Headings:* **Ha distribution, Thunderstorms, Florida, Ohio.**

D–189 551.578.7

Escobar V., Ismaél, **Estudio sobre el granizo.** [Study on hail.] *Nimbus*, 1(3):1–32+, July Sept. **1949.** figs., tables, ref. *Idem*, 1(4):14–29, Oct.–Dec. **1949.** figs., refs. **DWB**—Besides general discussion of hail formation, structure, damage, insurance and protection, these two articl contain monthly and seasonal hail data in tabular and graphic form. Data are based on observatio from 121 stations in Bolivia with two-30 years of record. *Subject Headings:* **Hail distributio Bolivia.**

D–190 551.578.72(78)(78

*§Harrison, H. T., Jr. and Beckwich, W. B., **A re-examination of hail patterns over western Unite States.** Denver, United Air Lines, **1950.** 27 p., 15 figs., refs. Summary p. 26–27. (United A Lines Circular No. 35.) **U.S., NACA**—Geographical distribution of hail; damage to aircraft alof local observations of hail and synoptic patterns for hail at Denver; problems of hail forecastin pilots responsibility for avoiding hail. *Subject Headings:* **Hail distribution, Denver, Colorad Western States.**

HAIL DAMAGE, PREVENTION AND INSURANCE

D–191 551.578.7:551.577.6

*Phillips, Frank J., **Hail injury on forest trees.** *Academy of Science of St. Louis, Transaction* 19(3):49–56, March 10, **1910.** fig., plates, table, refs. **DWB**—Includes data to show that th Middle West is best field for investigation. Table gives number of days with hail from April throug September for thirteen stations in Nebraska. Records kept from 20 to 32 years. Plates sho injury to twigs of various types. *Subject Headings:* **Hail damage, Hail distribution, Nebraska.**

D–192 551.578.7:551.577.6

Scott, James H., **Severe hailstorm on James Island, S. C.** *Monthly Weather Review*, 41(5):67 May **1913.** **DWB**—Cotton and truck crops severely damaged. *Subject Headings:* **Hail damag South Carolina.**

D–193 551.578.7:551.577.61

Loveland, George A., **Nebraska hailstorm of August 8, 1917.** *Monthly Weather Review*, 5(11):540–542, Nov. 1917. fig. **DWB**—Enormous quantity of hail fell. Considerable property ss: windows, farm animals, fruit and shade trees. Maps shows path of storm through eastern ebraska. *Subject Headings:* **Hail damage, Nebraska.**

D–194 551.578.7:551.577.61

Alter, J. Cecil, **Hailstorm at Lehi, Utah.** *Monthly Weather Review*, 48(8):451–452, Aug. 1920. notos. **DWB**—Most destructive hailstorm on record in the state. Size and shape of stones. Crop estruction unusual. Photos show one type of damage and size of stones. *Subject Headings:* **Hail amage, Hail structure, Utah.**

D–195 551.578.7:551.577.61

Holmes, J. S., **Damage to forests by hail in North Carolina.** *Monthly Weather Review*, 49(6):333 ne 1921. **DLC**—Hailstorm in Anson County on April 28, [1921]. About 10% of foliage left on a rested area. *Subject Headings:* **Hail damage, Forests, North Carolina.**

D–196 551.578.7:551.577.61

[Richardson, Herbert W.], **Hailstorm at Duluth, Minn., June 10, 1929.** *Monthly Weather eview*, 57(6):255–256, June 1929. **DWB**—Hailstone size; marbles to baseballs. Damage: store indows, street lights, auto windows, etc. *Subject Headings:* **Hail damage, Minnesota.**

D–197 551.578.7:551.577.61

Flora, Snowden D., **Hailstorms of 1929 in the United States.** *Monthly Weather Review*, 7(12):509–510, Dec. 1929. table. (Condensed from a report by the author.) **DWB**—Greatest amage for year at Hartford, Connecticut, on Aug. 1st. *Subject Headings:* **Hail damage, United tates.**

D–198 551.578.7:551.577.61

Flora, Snowden D., **Destructive force of hail.** *Tycos Rochester*, 22(4):129–130, Oct. 1932. 3 gs. **DLC**—*Subject Heading:* **Hail damage.**

D–199 551.578.7:551.577.61:368

Rohrbeck, Walther and Schlumberger, Otto, **Die Schätzungsgrundlagen bei Hagelschäden.** On the first principles of evaluating hail damages.] Berlin, Paul Parey, 1933. 36 p., 15 plates, fs. **DWB**—Detailed description of damage to plants with illustrations of types of damage. Written for insurance adjuster. *Subject Headings:* **Hail damage, Hail insurance.**

D–200 551.578.7:551.509.67

Marescalchi, Arturo, **Cannoni contro il cielo.** [Cannon against the sky.] *Nuova Antologia*, 74(12):419–431, Aug. 1, 1934. refs. (7th ser., 69, [1497].) **DLC**—Hail shooting experiments in aly. *Subject Headings:* **Hail shooting, Italy.**

D–201 551.578.7:551.577.61

Barron, W. E., **Heavy hail losses in western Canada.** *American Meteorological Society, Bulletin*, 5(12):308–309, Dec. 1934. **DWB**—Crop loss in Saskatchewan from beginning of 1934 to latter part July was estimated at $2,500,000. *Subject Headings:* **Hail damage, Crops, Saskatchewan, anada.**

D–202 551.578.7:551.577.61:368

Hummel, Alfred, **Die Beurteilung von Hagelschäden.** [The valuation of hail damage.] erlin, Reichsnährstand Verlags, [1936]. 49 p., 41 figs. **DLC**—Illustrations and descriptions of ypes of hail damage to various grains. Suggests precautions to be taken in evaluating damage in espect to insurance. *Subject Headings:* **Hail damage, Hail insurance.**

D–203 551.578.7:551.577.61

Hamilton, W. J., Jr., **Hailstorms and avian mortality.** *Auk*, New Series, 54(1):97, Jan. 1937. **LC**—Examination of bird killed by hailstones. Brief reference to storm with stones as large as arbles. *Subject Headings:* **Hail damage, Bird life, New York.**

D–204 551.577.61:551.578.7

Hrudička, B., **Über Hagelschlag in Mähren-Schlesien.** [On hail damage in Moravian Silesia.] *Meteorologische Zeitschrift*, 54(7):265–267, July 1937. 2 figs., refs. **DWB**—Based on records of hail amage for the years 1926–1935, the frequency of hail in various parts of Moravian-Silesia, and the

hail damage "quotient" or probability is calculated and shown on two charts. Results are the sam as found in Bohemia; the place of greatest hail damage frequency is not the same as that of th greatest rainfall or thunderstorm occurrence. *Subject Headings:* **Hail damage probability, Silesi Czechoslovakia.**—*M.R.*

D–205 551.578.7:551.577.6

Kincer, Joseph B., **The national loss from windstorms, hail, floods, drought, and other weath vagaries.** *American Meteorological Society, Bulletin*, 18(9):304–306, Sept. **1937. DWB**—Giv percentage of wheat crop lost in one state in one year; value of loss over 12 year period in anothe loss in bushels for major crops over the country over a 17 year period. *Subject Headings:* **Ha damage, Crops, United States.**

D–206 551.578.7:551.577.6

Moreux, T., **Peut-on se défendre contre la grêle?** [Is hail protection possible?] *Revue Cie* Bourges, 3ᵉ série, 22:147–149, **1937.** (Unchecked.)—*Subject Heading:* **Hail damage protection.**

D–207 551.515.4:551.578.7:551.577.6

§Piersig, W., **Gewittertätigkeit und Hagelwetter in Südbayern am 27. Juli 1936.** [Thunde storm activity and hailstorms in South Bavaria on July 27, 1936.] *Meteorologische Zeitschrift* 55(2):48–54, Feb. **1938.** 5 figs., 3 tables, 8 refs. Abstract p. 48. Discussion by Franz Zimme *idem*, 55(4):153, April **1938.** 3 figs. **DWB**—Synoptic and aerological analysis of conditions befor and during an outbreak of cold air into Bavaria, which resulted in severe thunderstorms, heavy rai and widespread hail damage along a strip 15 km. wide and 180 km. long. Along the borders of th strip, hailstones decreased in size from that of grapes to pea-size, but in a central belt about 10 km wide the sizes ranged from that of walnuts to hens' eggs or even the size of a man's fist; crops wer 70 to 100% destroyed, hail lay 3 hours on the ground like snow, trees over 3′ in diameter were blow down, visibility was reduced to 10 or 15 m., and livestock killed. No orographic influence was note This storm was not the most severe in Germany—(the one of July 8, 1927 in the East Erzgebirg killed 146 people). *Subject Headings:* **Hail damage, Thunderstorms, Synoptic-aerological studie Bavaria, Germany.**—*M.R.*

D–208 551.578.7:551.577.6

Hrudička, B., **Die Hagelverhältnisse in Böhmen.** [Hail conditions in Böhemia.] *Meteor logische Zeitschrift*, 55(3):111–112, March **1938.** fig., 9 refs. **DWB**—After reviewing the sources data and early studies on hail distribution in Bohemia (Kreil, 1865), the author presents data f various parts of the country along with a chart showing the probability of hail according to five clas intervals ranging from the minimum of <1% to a maximum of >4%. Extreme maximum prob ability of 10% is in south Bohemia where the thunderstorm frequency is least. In the north wher hail damage probability is least, the maximum rainfall amount and thunderstorm frequency prevails *Subject Headings:* **Hail damage probability, Bohemia, Czechoslovakia.**—*M.R.*

D–209 551.578:632.

Brachet, C., **Pour lutter contre les chutes de grêle, utilisez l'avion.** [Combatting hail occu rence by use of airplanes.] *Science et Vie*, Paris, 53:101–108, **1938.** Abstract p. 101. (Unchecked *Subject Heading:* **Hail prevention.**

D–210 551.578.7:551.577.6

Schlumberger, Otto, **Hagelversicherung und Schadensbeurteilung beim Körnemais.** [Ha insurance and estimation of damage to corn (maize).] Berlin, Paul Parey, **1938.** 19 p., 6 figs **DA**—*Subject Headings:* **Hail damage, Crops.**

D–211 551.578.7:551.577.61:36

Hummel, Alfred, **Wissenschaftliche Grundlagen zur Schätzung von Hagelschäden; eine leich verständliche Unleitung für den praktischen Schätzer.** [Scientific bases for estimate of hail damage an easily understood guide for the practical appraiser.] Berlin, Reichsnährstand Verlags, [**1938**] 52 p., 47 figs. Summary p. 47–49. **DLC**—Detailed discussion of the effect of hail damage on th growing process of plants, particularly grain. Illustrations show effect of different types of damage *Subject Headings:* **Hail damage, Hail insurance.**

D–212 551.578.7:632.

Allix, André, **L'étude de la grêle par avion et le système de défense du Beaujolais.** [The study of hail by airplane and the system of defense of Beaujolais.] **Revue pour l'Étude des Calamité** [Geneva], 2(5):89–100, March–April **1939.** 4 figs., refs. **DWB**—Explanation of hail defense system used in Beaujolais where damage to vineyards has been extensive. Bombs are dropped on portion

f thundercloud where hail is forming, and these are supplemented by mobile ground batteries. uccess is claimed. *Subject Headings:* **Hail prevention, France.**

D–213 551.578.7:551.577.61

U. S. Dept. of Agriculture, **Other climatic influences; cold frost and hail.** (In its *Yearbook of griculture*, 1941. *Climate and man.* Washington, D. C., U. S. Government Printing Office, **1941.** . 314.) **DA**—Loss of corn from hail is small compared to total crop. Most common types of amage. Sale of hail insurance would indicate greatest losses in mid-western states. *Subject Headngs:* **Hail damage, United States.**

D–214 551.578.7:551.577.61:63

Lemons, Hoyt, **Hail in American agriculture.** *Economic Geography*, 18(4):363–378, Oct. **1942.** 7 figs., table. **DWB**—Survey of planting and harvesting dates of principal crops to stress imortance of hail as a climatic hazard. *Subject Headings:* **Hail damage, Agricultural meteorology, nited States.**

D–215 551.578.7:551.577.61

Darbre, Pierre, **Le probleme de la grêle- état actuel.** [The problem of hail-present status.] *ociété Vaudoise des Sciences Naturalles*, Lausanne, 62(260):261–272, July **1943.** 3 figs., 3 tables, efs. **DLC**—*Subject Headings:* **Hail damage, Hailstorms, France.**

D–216 551.578.7:551.577.61

Tomlinson, A., **June in England.** *Royal Meteorological Society, Quarterly Journal*, 69(301):214, uly **1943.** photo. **DLC**—Hail, though not large, caused severe and unusual damage to vegetables nd fruits. *Subject Headings:* **Hail damage, Great Britain.**

D–217 551.578.7:551.577.61

Costa, Giulio Dalla, **La stima dei danni della grandine alla coltura del tabacco.** [Estimation of ail damage to tobacco culture.] Bologna, Edizione Agricole, [**1943**]. 195 p. (Manuali di conomia e di Tecnica Agraria, 2.) (Unchecked.) **DA**—*Subject Heading:* **Hail damage.**

D–218 551.578.7:551.577.61

Piacco, Romeo, **La stima dei danni della grandine alla coltura del riso.** [Estimation of hail amage to rice culture.] Bologna, Edizione Agricole, [**1943**]. 304 p., 114 figs., tables, 59 refs. Manuali de Economia e di Tecnica Agraria, 1.) (Unchecked.) **DA**—*Subject Heading:* **Hail damage.**

D–219 551.578.7:551.577.61

L'orage a grêle du 29 Juin 1944 dans le nord du Loir-et-Cher. [Hailstorm on June 29, 1944 in orthern Loir-et-Cher.] *La Météorologie*, 3e Série, p. 111–112, Jan.–June **1944.** fig., ref. **DWB**—rief account of area and damage of hailstorm with stones as large as oranges. *Subject Headings:* **[ail damage, France.**

D–220 551.578.7:551.577.52:632.1

Gregor, W. T., **Kan bome hael keer?** [Do trees stop hail?] *Veldtrust-Nuus*, 2(5):4, Jan. **945. DA**—*Subject Headings:* **Hail prevention, Forest influences.**

D–221 551.578.7:551.577.61

Story, C. G., **Hail damage to sugar cane at Bundaberg.** *Cane Growers' Quarterly Bulletin*,)(3):115–117, Jan. 1, **1947.** 2 figs. (Bureau of Sugar Experiment Stations, Brisbane, Queensland.) **)A**—*Subject Headings:* **Hail damage, Australia.**

D–222 551.578.7:629.13

Mann, Martin, **War against hail.** *Popular Science*, 150(6):82–88, June **1947.** fig., photos. **)LC**—Reviews briefly the work of Langmuir, Schaefer, von Neumann and Zworykin. Army's nterest is in eliminating supercooled clouds that cause icing over airfields. Written in popular style. *ubject Headings:* **Hail prevention, Icing of aircraft.**

D–223 551.578.7:551.577.61

Calhoun, Seabron, **Hail damage to soybeans.** *Soybean Digest*, 7(9):14–15, July **1947.** 2 photos. **)A**—*Subject Heading:* **Hail damage.**

D–224 551.578.7:551.577.61

Kalton, Robert R. and Eldredge, J. C., **Can hail ruin soybeans?** *Iowa Farm Science*, [Ames, owa], 2(1):5–8, July **1947.** figs. **DA**—*Subject Heading:* **Hail damage.**

D–225 551.578.7:551.577.

Huguet, Louis, **Quelques principes généraux et renseignements sur la technique de l'experti des dommages causés par la grêle à la vigne.** [Some general principles and information on t technique of appraising hail damage to vineyards.] *Agriculture*, [Paris], 11(84):289–290, Oct. 194 **DA**—*Subject Heading:* **Hail damage.**

D–226 551.578.7:551.577.61:629.

American Airlines System, **Some preliminary data affecting design criteria for nose radom with respect to hail penetration. 1947.** 4 p., photos. Summary p. 1. (Flight Engineerin ANTC Branch, Technical Note No. 3. Navy Contract $No_a(S)$ 9006.) **U.S., NACA**—Conclud that though sandwich type of radome appears to be superior with respect to radar performance, is not known that it would be superior to other known types of radomes with respect to hail penetr tion. Photos show damage to planes. Pilot's report included. *Subject Headings:* **Hail damag Aeronautics.**

D–227 551.578.7:551.577.61:629.

A violent hailstorm in Oxfordshire on May 11, 1945. *Meteorological Magazine*, [London 77(909):65, March **1948.** 2 plates. **DWB**—Rapid melting of hailstones put one airfield out commission, temporarily. Experience of a pilot who descended through a gap in a large cumul nimbus cloud in the neighborhood. Path of storm given. Information on winds and upper a temperature given. Three photos are proof of damage to aircraft. *Subject Headings:* **Hail damag Aeronautics, Great Britain.**

D–228 551.578.7:551.577.

Birke, Paul, **Was der praktische Landwirt von der Hagelschätzung wissen muss.** [What t practical farmer must know about the estimation of hail damage.] *Land, Wald und Garte* **3**(6):131–132, June **1948. DA**—*Subject Heading:* **Hail damage.**

D–229 551.578.7:551.577.

Berg, G., **Något om hagel-och regnskador på hampa.** [Hail and rain injuries to flax.] *Li Dansk Svensk Hörtidsskrift*, 2(7):151–153, Sept. **1948.** 6 figs. **DA**—*Subject Heading:* **Hail damag**

D–230 551.578.7:551.577.

Valset, Tormod, **Haglskadetakst i eplehage.** [Hail injury estimate in apple orchard.] *Nors Hagetidend*, 64(12–13):166–167, Sept. 1/15, **1948.** table. **DA**—*Subject Heading:* **Hail damage.**

D–231 551.578.7:551.577.

Malenotti, E., **Si puo combattere la grandine?** [Can hail be controlled?] *Giornale di Agr coltura*, 58(45):3, Nov. 7, **1948.** photo. **DA**—*Subject Heading:* **Hail prevention.**

D–232 551.578.7:551.577.61:629.

American Airlines System, **Information on second case of hail damage to DC-6 aircraft NC 90733. 1948.** 2 p. Summary p. 1. (Flight Engineering, ANTC Branch, Technical Note No. 3. **U.S., NACA**—Pilot's report of storm and damage from hail. Shows need of a satisfactory metho for measuring drop sizes and hail diameter prior to entering storm. *Subject Headings:* **Hail damag Aeronautics.**

D–233 551.578.7:551.577.61:629.

American Airlines System, **Information on fifth case of hail damage to DC-6 aircraft (NC 90702) 1948.** 2 p. Summary p. 1. (Flight Engineering, ANTC Branch, Technical Note No. 5. **U.S., NACA**—Ten minute encounter with hail resulted in minor damage because of reduced speed *Subject Headings:* **Hail damage, Aeronautics.**

D–234 551.578.7:551.577.6

Morris, H. E., **Simulated hail damage to sugar beets.** American Society of Sugar Beet Tech nologists, Proceedings of Fifth General Meeting, p. 358–362, **1948.** 3 tables. (Published by Bee Sugar Development Foundation, Fort Collins, Colorado.) **DA**—*Subject Heading:* **Hail damage.**

D–235 551.578.7:551.577.6

Spain. Servicio Meteorológico Nacional, **Daños producidos por el pedrisco y medios para evitarlos.** [Damage produced by hail and methods for preventing it.] (In its **Calendario Meteoro Fenológico 1949.** Madrid, Sección de Climatología, [1948?]. p. 104–114, 3 figs.) **DWB**—*Subject Headings:* **Hail damage, Hail prevention.**

D–236 551.578.7:551.577.61

*Capitanelli, Ricardo G., **El problema general del granizo y pedrisco, particularmente en Mendoza.** [The general problem of small and large hailstones, particularly in Mendoza.] *Boletin de studios Geograficos*, [Mendoza], 1(2):53.66, 1st quarter **1949.** 2 tables, refs. **DLC**—Between 1929 nd 1948, ¼ of damage to vineyards by weather disasters was caused by hail. Definitions of types hail. Conditions for formation of hail, with the local or convective type being found at Mendoza. ethods of hail protection, negative results. One table gives percentage of damage to vineyards om all causes and one for damage from hail only. Data was collected from 17 stations for period om 1930 to 1948. *Subject Headings:* **Hail damage, Vineyards, Argentina.**

D–237 551.578.7:368

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Klug, P., **Der Hagelsturm vom 2 August 1948 und seine katastrophale Auswirkung auf die ndwirtschaft im "Klutzer Winkle."** [The hailstorm of August 2, 1948 and its catastrophic effect n agriculture in the "Klutzer Corner."] *Zeitschrift für Meteorologie*, 3(4):115–116, April **1949.** . **DWB**—North Germany, especially northwest Mecklenburg, suffered a severe thunderstorm ith hail squalls (force 11) which did enormous damage over an area of 75 sq. km. *Subject Headings:* **ail damage, Germany.**—*C.E.P.B.*

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PART III. METEOROLOGICAL ARTICLES APPEARING IN RECENTLY ISSUED PUBLICATIONS

Note: The contents of periodicals, included in this section, are for information only, and will not be listed in either the author or subject indexes. When material is furnished in advance of date of publication, the pagination may be omitted.

American Geophysical Union, Transactions, Volume 31, Number 2, Part 1, April 1950.

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Időjárás, Vol. 54, No. 1–2, January–February 1950.

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